

LONDON  
SCHOOL of  
HYGIENE  
& TROPICAL  
MEDICINE



LSHTM Research Online

Pieterse, SGEM; (1999) Nutritional vulnerability of older refugees. PhD thesis, London School of Hygiene & Tropical Medicine. DOI: <https://doi.org/10.17037/PUBS.04656736>

Downloaded from: <https://researchonline.lshtm.ac.uk/id/eprint/4656736/>

DOI: <https://doi.org/10.17037/PUBS.04656736>

**Usage Guidelines:**

Please refer to usage guidelines at <https://researchonline.lshtm.ac.uk/policies.html> or alternatively contact [researchonline@lshtm.ac.uk](mailto:researchonline@lshtm.ac.uk).

Available under license. To note, 3rd party material is not necessarily covered under this license: <http://creativecommons.org/licenses/by-nc-nd/3.0/>

<https://researchonline.lshtm.ac.uk>

# **Nutritional vulnerability of older refugees**

**Simone G. E. M. Pieterse**

**Thesis submitted to the Faculty of Medicine of the  
University of London for the degree of Doctor of Philosophy**

**Public Health Nutrition Unit  
Department of Epidemiology and Population health  
London School of Hygiene and Tropical Medicine**

**November 1999**



*To the refugees*

## Abstract

**Objective:** To examine the determinants of nutritional vulnerability in older refugees.

**Design:** Cross-sectional data collection included anthropometry, functional ability measures (physical performance tests and independence in activities of daily living (ADL)), clinical screening, food frequency and socio-economic information. In-depth and group interviews were conducted in a sub-sample. To calculate body mass index (BMI) for the 5% with kyphosis, height was estimated from armspan using sex-specific regression equations from the non-kyphotic group.

**Setting:** The study was carried out in the post-emergency phase in a Rwandan refugee camp in Karagwe district, north-west Tanzania.

**Subjects:** 413 men and 415 women aged 50-92 years.

**Results:** Results of this study may not be generalised as the refugees were most likely a self-selected group in that those with poorest nutritional status may have been left behind or have died on the way to the camp or soon after arrival and because of the presence of HelpAge International. Physical test performance was lower in women than in men and lower in older age groups. Independence in ADLs was above 90% in both sexes. Functional ability problems mainly related to mobility. Individuals with poor nutritional status had an almost double risk of impaired handgrip compared to those with adequate nutritional status.

The prevalence of undernutrition ( $BMI < 18.5 \text{ kg/m}^2$ ) was 19.5% in men and 13.1% in women and was higher above age 60 in both sexes ( $P < 0.05$  in men). Arm muscle area (AMA) was also significantly lower in older age groups. No difference was found in arm fat area. The proportion with low BMI was much higher in the group with kyphosis.

Using multivariate techniques, handgrip strength proved to be the strongest independent determinant of nutritional vulnerability. People of poor nutritional status had less handgrip strength both absolutely as well as relative to their body size. Other significant determinants were food and health related and socio-economic factors. The total explained variance in men was 19.3% with BMI as nutritional status indicator and 26.4% with AMA, and in women 11.5% and 19.5% respectively. Older people themselves defined vulnerability according to the following main criteria: physical impairment, lack of purchasing power, and lack of support. A screening tool for entry into feeding or (social) support programmes is proposed based on anthropometric, clinical and social criteria.



**Conclusions:** Undernutrition occurred among older refugees and was more prevalent at advanced age and among kyphotic people, illustrating the importance of including this group in nutritional status assessments. A relationship between poor nutritional status and impaired functional ability was demonstrated independent of age, sex and health conditions. Older refugees of poor nutritional status are likely to be more dependent, which will affect their quality of life.

## Contents

Abstract	3
Contents	5
List of tables	9
List of figures	11
List of plates	12
Glossary	13
Acknowledgements	15
 <b>1. Introduction</b>	 <b>16</b>
 <b>2. Nutritional status assessment in older people</b>	 <b>19</b>
2.1 Nutrition and ageing	19
2.2 Assessment of nutritional status by anthropometry	20
2.2.1 Body composition changes with age	21
2.2.2 Weight	22
2.2.3 Height	23
2.2.4 Alternatives to height	24
2.2.4.1 Kneeheight	25
2.2.4.2 Armspan	27
2.2.4.3 Demispan	28
2.2.4.4 Halfspan	30
2.2.5 Body mass Index	31
2.2.6 Skinfolds	33
2.2.7 Circumferences	34
 <b>3. Functional ability assessment in older people</b>	 <b>36</b>
3.1 Activities of Daily Living	37
3.2 Instrumental Activities of Daily Living	38
3.3 Physical performance tests	38
3.3.1 Mobility	39
3.3.2 Range of motion and flexibility	40
3.3.3 Psychomotor function	41
3.3.4 Muscle strength	42
3.4 Nutritional status and functional outcome	45
3.5 Self-perceived health	50
3.6 Social factors in relation to nutritional and functional status	51

	6
<b>4. Nutritional vulnerability</b>	55
4.1 The concept of vulnerability	55
4.2 Nutritional risk factors	57
4.3 Nutritional vulnerability in unstable situations	60
4.4 Components of nutritional vulnerability	63
4.4.1 Physical factors	63
4.4.2 Economic factors	64
4.4.3 Social factors	65
4.4.4 Psychological factors	68
4.5 Gender differences in vulnerability	69
4.6 Nutritional vulnerability assessment	70
4.7 Addressing vulnerability	72
<b>5. Study design and methodology</b>	76
5.1 Profile of study area	77
5.2 Study location and population	78
5.3 Initiation of the study	81
5.4 Implementation of the study	82
5.5 Measurements	87
5.5.1 Anthropometry	87
5.5.2 Independence in activities of daily living	93
5.5.3 Physical performance tests	93
5.5.4 Clinical screening	96
5.5.5 Other data collected	97
5.6 Data handling and analysis	100
<b>6. Qualitative results</b>	101
6.1 Background to the study population and site	101
6.1.1 Physical conditions in the camp	101
6.1.2 Socio-economic situation	104
6.2 Perceptions of vulnerability	107
6.3 Risk factors emerging from the case studies	110
6.4 Characteristics of the study sample	110
6.4.1 Social and economic characteristics	111
6.4.2 Health and clinical signs and symptoms	117
6.4.3 Food and diet	120

<b>7.</b>	<b>Quantitative results</b>	<b>127</b>
7.1	Anthropometric characteristics	127
7.1.1	Comparison between sexes	127
7.1.2	Comparison between age groups	129
7.1.3	Derivation of BMI	131
7.1.4	Indicators of undernutrition	133
7.2	Physical tests	136
7.2.1	Comparison between sexes	136
7.2.2	Comparison between age groups	137
7.2.3	Scored physical tests	138
7.3	Activities of Daily Living	138
7.4	Nutritional status and functional ability indicators	140
7.4.1	Associations between nutritional status and functional ability variables	140
7.4.2	Associations with socio-economic and health variables	143
7.5	Nutritional vulnerability	144
7.5.1	A hierarchical model of nutritional and functional determinants	145
7.5.2	Multiple linear regression strategy	149
7.5.3	Determinants of nutritional vulnerability	150
7.6	Oedematous subjects	153
<b>8.</b>	<b>Discussion</b>	<b>155</b>
8.1	Social and economic situation	155
8.2	Health situation	158
8.3	Food and diet	162
8.4	Anthropometry	164
8.4.1	Height and alternatives	165
8.4.2	Weight and BMI	169
8.4.3	Estimates of fat and muscle tissue	171
8.4.4	Classifying undernutrition in older people	173
8.5	Functional ability	175
8.5.1	Dependence in activities of daily living and mobility	175
8.5.2	Physical test performance	177
8.6	Determinants of vulnerability	181
8.6.1	Nutritional vulnerability	181
8.7	Qualitative data	190
8.8	Vulnerability of older refugees: determinants and interventions	192

<b>9. Conclusions and recommendations</b>	<b>202</b>
9.1 Conclusions	202
9.2 Recommendations	204
<b>References</b>	<b>208</b>
<b>Annexes</b>	<b>238</b>
<b>Chapter 5</b>	
5.1 Lay-out of Chabalisa II	239
5.2 Informed consent form	240
5.3 Indian data and formula for sample size calculation	241
5.4 Formulae for derived variables	242
5.5 Formulae for the technical error of measurement and reliability	243
5.6 Intra- and inter- observer errors for anthropometric measurements	244
5.7 ADL questionnaire	245
5.8 Clinical screening protocol	248
5.9 Social factors questionnaire	255
5.10 Characteristics of individuals in the case study sub-sample	261
5.11 Case study protocol	262
<b>Chapter 6</b>	
6.1 Summaries of the case studies	266
6.2 Group characteristics at various levels of well-being defined by men and women	307
6.3 Prevalences of demographic characteristics by age groups	308
6.4 Prevalences of living arrangements and care by age groups	309
6.5 Prevalences of material and financial support by age groups	310
6.6 Prevalences of respect and emotional support by age groups	311
6.7 Prevalences of involvement in activities by age groups	312
6.8 The health situation among the refugee population in Karagwe	313
6.9 Prevalences of clinical signs and symptoms by age groups	315
6.10 Prevalences of food preparation by age groups	317
<b>Chapter 7</b>	
7.1 MUAC-BMI regression equation and sensitivity and specificity data	318
7.2 Associations between poor test performance and low BMI	319
7.3 Regression results for nutritional vulnerability	320
7.4 Proportions of people with and without oedema who presented risk factors	325

## List of tables

### Chapter 2

2.1	Epidemiological diagnosis of Chronic Energy Deficiency (CED)	32
-----	--	----

### Chapter 5

5.1	National figures of income and social and health indicators in 1991	77
5.2	Karagwe refugee population as per 9 December 1995	78
5.3	Sample sizes required to estimate the prevalence of undernutrition	83
5.4	Sample size estimates for descriptive analysis based on expected frequency of functional impairment	84
5.5	Sample size estimates for multivariate analyses based on expected frequency of functional impairment	84

### Chapter 6

6.1	Age and sex distribution of the sample	111
6.2	Demographic characteristics by sex and age	112
6.3	Living arrangements and care	113
6.4	Material and financial support	114
6.5	Respect and emotional support	115
6.6	Activities of older people	116
6.7	Prevalence of clinical signs and symptoms by sex and age	118
6.8	Composition of general food ration in 1996 and macro-nutrient value	120
6.9	Frequency of food group consumption	123
6.10	Food preparation by age and sex	125

### Chapter 7

7.1	Anthropometric characteristics of men and women	128
7.2	Anthropometric variables compared between age groups in men	129
7.3	Anthropometric variables compared between age groups in women	130
7.4	Prevalences of undernutrition by sex based on BMI using alternatives to height	131
7.5	Sex-specific equations for height versus each alternative measurement in the non-kyphotic group	132
7.6	Distribution of BMI	133
7.7	Sensitivity and specificity of MUAC measurements in predicting poor nutritional status as measured by BMI	135
7.8	Means of physical test in men and women	136
7.9	Proportions dependent in activities of daily living	139
7.10	Proportions dependent in mobility	140

	10
7.11 Significant correlation coefficients ( $P < 0.05$ ) between handgrip strength and anthropometric variables by age and sex	141
7.12 Correlation between handgrip strength and other tests	142
7.13 Prevalence of low BMI and impaired handgrip strength in relation to responses to socio-economic and health questions	144
7.14 Determinants of poor nutritional status in men	151
7.15 Determinants of poor nutritional status in women	152
7.16 Determinants of low fat reserves in men and women	152
7.17 Determinants of low BMI with corrected handgrip strength as independent variable	153

## Chapter 8

8.1 Recommended equations for predicting height in black Americans and Rwandan refugees	167
8.2 Anthropometric means of older adults from Malawi, Rwanda and the USA	168
8.3 Mean handgrip strength in developing and developed country populations	179
8.4 Differences and similarities with corrected handgrip strength as independent variable instead of ordinary handgrip strength	186
8.5 Sensitivity and specificity of risk indicators in identifying poor nutritional status ( $BMI < 18.5 \text{ kg/m}^2$ )	197
8.6 Proposed screening tool	200

## List of figures

### Chapter 2

2.1	Position for height measurement	24
2.2	Position for recumbent kneeheight measurement	25
2.3	Position for armspan measurement	28
2.4	Position for demispan measurement	29
2.5	Position for halfspan measurement	31

### Chapter 4

4.1	Inter-relations of nutritional status, functional ability, morbidity and mortality	58
-----	--	----

### Chapter 6

6.1	Food satisfaction by age	124
-----	--------------------------	-----

### Chapter 7

7.1	CAMA (cm <sup>2</sup> ) by age and sex	130
7.2	Percentage undernourished (BMI < 18.5 kg/m <sup>2</sup> ) by age and sex	133
7.3	Percentage with low MUAC (men < 23 cm, women < 22 cm) by age and sex	134
7.4	Age distribution in worst performing percentile	137
7.5	Performance without problems in scored physical tests	138
7.6	Proportion with impaired handgrip strength across BMI categories	142
7.7	Hierarchical model for nutritional vulnerability	146

### Chapter 8

8.1	Determinants of vulnerability of older refugees	193
-----	---	-----



## List of plates

### Chapter 3

3.1	Plate tapping test	42
3.2	Handgrip strength measured with a dynamometer	44

### Chapter 5

5.1	Location of Chabalisa II camp	79
5.2	Overview of the camp	79
5.3	Height measurement	88
5.4	Armspan measurement	89
5.5	Kneeheight measurement	90
5.6	Triceps skinfold measurement	91
5.7	External shoulder rotation	95
5.8	Interview in blende	99

### Chapter 6

6.1	Working in HAI's communal garden	106
6.2	Mat making	116
6.3	An old woman cooking in her blende	125

## Glossary

ADL	Activities of daily living
AFA	Arm fat area
AFI	Arm fat index
AMA	Arm muscle area
Blende	Refugee shelter
BMI	Body mass index
BP	Blood pressure
CAMA	Bone corrected arm muscle area according to sex
CDC	Center for Disease Control
H/A	Height for age
HAI	HelpAge International, a global network of non-profit organisations with a mission to work with and for disadvantaged older people worldwide to achieve a lasting improvement in the quality of their lives.
IADL	Instrumental activities of daily living
Internally displaced persons	People who migrate to safer places within their own countries. In contrast to refugees, internally displaced persons do not enjoy any legal status. For several reasons internally displaced persons are more difficult to protect than refugees.
Kyphosis	Hunching of the back and shoulders, visible spinal curvature.
LSHTM	London School of Hygiene and Tropical Medicine
Memisa	Medical NGO, operational in Chabalisa II
MSF	Médecins Sans Frontières, medical NGO operational in emergencies
MUAC	Mid-upper arm circumference
NGO	Non Governmental Organisation
NHANES	National Health and Nutrition Examination Survey of the USA. So far three surveys have been carried out.
RDA	Recommended Daily Allowance
Refugee	Any person who..."owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of particular social group or political opinion, is outside the country of his nationality and is unable to or, owing to such fear, is unwilling to avail himself of the protection of that country; or who, not having a nationality and being outside the country of his former habitual residence..., is unable or, owing to such fear, is unwilling to return to it." (as defined by the 1951 Geneva Convention and

amended by the 1957 Protocol relating to the Status of Refugees)

The Organisation of African Unity adopts a broader definition of the term 'refugee' that does not include any temporal or geographical limitations and allows to grant refugee to groups, not only to individuals, which is of particular importance in situations where large numbers of people have been forced to flee. The broader definition of 'refugee' includes "...anyone who owing to external aggression, occupation, foreign domination or events seriously disturbing public order in either part or the whole of his country of origin or nationality, is compelled to leave his place of habitual residence in order to seek refugee in another place outside his country of origin or nationality" (UNHCR, 1993).

Sensitivity	Proportion of true positives that are correctly classified
Specificity	Proportion of true negatives that are correctly classified
TSh.	Tanzanian Shilling, 600 was worth 1 pound Sterling in December 1995
TUA	Total upper-arm area
Ugali	Stiff maize porridge
UNHCR	United Nations High Commissioner for Refugees is an organ that, under the auspices of the United Nations, mainly provides protection to refugees who fall within the scope of their present Statute, and tries to seek permanent solutions to the refugee problem.
WFP	World Food Programme
W/H	Weight for height
WHO	World Health Organisation
$\chi^2$	Chi square

## Acknowledgements

In the first place I thank Dr. Suraiya Ismail for her professional and moral support. She was a source of inspiration and generosity throughout the study period. I am also particularly grateful to all Rwandan elderly and the research team for their enthusiastic participation in the study and for the many lessons learnt, and to the London elderly who participated in the pilot study.

Funding of the Department for International Development (UK) was essential to the study's implementation. HelpAge International initiated and partly funded this study and provided logistical and other support in collaboration with HelpAge Tanzania. The professional and personal support of HAI staff and friends in Tanzania was invaluable.

I greatly appreciated the help and friendship of my colleagues Mary Manandhar and Dorothy Chilima and support of others in the Public Health Nutrition Unit. I am also indebted to Mark Myatt and Tom Marshall for their statistical advice.

Finally I express warm gratitude to my family and friends, in particular to René who supported me in the broadest sense.

## 1. Introduction

There is evidence of a world-wide demographic transition (Kalache, 1991; Gorman, 1995). People not only live longer, but the proportion of older people in the population is also growing (WHO, 1989; Kinsella, 1996). Ageing is not confined to the developed world: already the majority of the world's older people live in developing countries and this proportion is expected to increase to nearly 80% by 2020. Moreover those above 80 years of age are the fastest-growing part of the world's older populations (Okojie, 1988; Restrepo & Rozental, 1994). Considering the living conditions of the majority in developing countries, these older people can be expected to have many nutritional and health problems that will adversely affect their quality of life and ability to carry out daily tasks independently (Manandhar, 1995). Although a growing number of studies include older people in developing countries, there is still a relative lack of data (WHO, 1995; de Onis & Habicht, 1997).

Man-made events like war and civil strife have generated millions of refugees<sup>1</sup> world-wide. Many countries have been deeply affected, as the origin or destination of mass population movements. The total number of uprooted people including internally displaced persons, grew by 40% between 1990 and 1993 (Toole & Waldman, 1993). The United Nations High Commissioner for Refugees (UNHCR) estimated the African figure to be 7.2 million in 1998, one-third of the global figure. Numbers of refugees cannot be expected to fall notably in the near future as new trouble spots emerge on a regular basis throughout the African continent.

Rwanda is a small east African country, inhabited by people mainly originating from the Hutu and Tutsi ethnic groups. Hutus and Tutsis lived together and intermarried for generations, which made it hard if not impossible to distinguish the original groups; nevertheless ethnic origin was described on identity cards. Political and administrative dominance and discrimination resulted in civil conflict. Overt tensions existed since 1959, causing civilians to move to safer places in and outside the country. The main parties were the Hutu-led government and the Tutsi-dominated rebels. An escalation of the

---

<sup>1</sup> See glossary for definitions of refugee and internally displaced person.

long-running conflict was triggered by the assassination of President Habyarimana on 6 April 1994. Large scale killings followed that caused a sudden, immense exodus such as the world had never seen before (MSF, 1995). According to the United Nations High Commissioner for Refugees (UNHCR), by 1995, Rwanda had produced 1.7 million refugees who had mainly fled to neighbouring Tanzania, Burundi, Zaire and Uganda.

People in flight face many problems. Their livelihoods including agriculture and food supply are disrupted leading to famine and undernutrition at a time of reduced or suspended health services. Those who end up in camps often find themselves in an environment where disease is rampant due to poor sanitation, contaminated food and water, and overcrowding (Kalipeni & Oppong, 1998). Preventable conditions such as respiratory infections and diarrhoea, exacerbated by undernutrition, result in high mortality rates (Toole & Waldman, 1997).

In unstable situations, older people can be particularly vulnerable as living conditions are harsh and social networks may have broken down; yet consideration of older people in these situations is still rare. Determining vulnerability to undernutrition amongst older adults may be a better indicator of a household's nutritional stress than levels of undernutrition in children alone. In semi-rural Kenya, assessment of the household's nutritional status based on children only, underestimated the prevalence of undernutrition in households by 50% compared to an assessment including all members (Kogi-Makau, 1992). There is some evidence that older people forego their food ration in favour of relatives. In Bosnia-Herzegovina undernutrition was found to be absent among children whereas the prevalence in older adults was 10-20% (Vespa & Watson, 1995). On the other hand, it has been suggested that in some cultures age bias regarding intra-household food allocation may be favourable to older people (Messer, 1997), and research among older people in an Algerian refugee community and in Ethiopia suggested that the elderly may be in a privileged position (Dejene, 1995; Branca, 1998).

This research project was a collaboration between HelpAge International (HAI) and the London School of Hygiene and Tropical Medicine (LSHTM). HAI is a global network of non-profit organisations with a mission to work with and for disadvantaged older people worldwide. Requests from various countries indicated a felt need for information

regarding undernutrition among older people in developing countries, particularly nutritional status assessment. International nutritionists had expressed the same need and the World Health Organisation (WHO) had called for more research in this field (WHO, 1995). In view of the ageing of populations, the UN adopted the UN Principles for Older persons in 1991. The resolution appeals for incorporation of principles addressing older people's rights to independence, participation in society, care, self-fulfilment and dignity (1994). The UN declared 1999 as the International year of Older Persons and research into ageing, including health and nutrition, has been put high on the political agenda (Annan, 1999; Andrews & Clark, 1999).

The current study was part of a research programme set up with the primary aim of making a contribution to resolving the lack of knowledge and operational tools for the assessment of nutritional vulnerability of community-living older people in developing countries. The first project was conducted among urban slum dwellers in Mumbai, India in 1993/94 (Manandhar, 1999). Data collection among Rwandan refugees living in a camp in Tanzania was carried out by myself in 1995/96. A similar study was undertaken in 1996 in Malawi (Chilima, 1998).

This report is structured as follows. An overview of the literature is given in the next three chapters: nutritional status assessment by anthropometry in chapter 2, functional ability assessment in chapter 3 and nutritional vulnerability in chapter 4. The following chapter describes the methodology of the study. Chapters 6 and 7 provide qualitative and quantitative results respectively. Finally the results are discussed in chapter 8 and conclusions and recommendations are presented in chapter 9.

## **2. Nutritional status assessment in older people**

The literature review comprises three parts. This chapter deals with anthropometry in the elderly. In the next chapter the assessment of functional ability will be discussed as well as the relation between nutritional status and functional outcome. Lastly chapter 4 discusses nutritional vulnerability with particular reference to older people in unstable situations.

### **2.1 Nutrition and ageing**

Recent studies have reported declining mortality and fertility rates resulting in a greater proportion of older people in the population (Sen, 1994). Factors such as advanced medical knowledge and techniques, rising living standards, improved child care, control of infectious diseases and improved nutrition have been mentioned as factors attributing to increased longevity (Watkin, 1982; Kalache, 1991; Kinsella, 1996). Regarding nutrition, dietary intake and nutritional status are being studied in relation to healthy ageing as well as morbidity and mortality. There is growing concern about the prevalence and impact of undernutrition in older people. Both in developing and western countries poverty is a major underlying cause. However even in hospitals and nursing homes where patients are supposed to be fed adequately, the prevalence of undernutrition is high among older patients (20-50%) causing increased morbidity and mortality (Abbasi et al, 1994; Elmståhl et al, 1997). In fact many older people are already undernourished at admission (McWhirter & Pennington, 1994; McCormack, 1997).

Numerous studies have been undertaken on age-related changes that may cause or contribute to undernutrition, covering physiological, biochemical, psychological and sociological aspects. Although many questions still remain unanswered and for instance nutrient requirements have not been tested directly in the elderly (Solomons, 1992), there is generally a strong impression that the ageing process alone has no significant adverse consequences on the caloric intake and nutritional status of healthy older individuals (Rosenberg et al, 1989; Vellas et al, 1992; Casper, 1995). The main threat to the nutrition of older people is inadequate nutrient intake resulting from reduced energy intake that is usually associated with decreasing activity levels. Insufficient fluid intake is another common problem. A nutrient-dense diet is thus generally recommended as well as regular fluid intake (Steen & MacLennan, 1991; Chernoff, 1994).



However a typical characteristic of older people is the diminished ability to regain weight (without extra nutritional support) after experiencing a stressful situation such as severe illness or bereavement, situations that are highly relevant to older refugees. Nutritional support has been proven to be effective not only in preservation of good health and function, but also in promoting better clinical outcome during rehabilitation from illness (Delmi et al, 1990; Vellas et al, 1990). Undernutrition can often be prevented or reversed if recognised early (Abbasi et al, 1994; Egbert, 1996). Therefore more attention to the assessment of nutritional status of older people may contribute to the quality of their lives (Lehman, 1989).

Although the words 'underweight' and 'undernourished' are not exactly the same, they are often used interchangeably. Whereas 'underweight' means being too light for one's body build, 'undernourished' implies a causal relationship between nutrition and body weight. Either food intake may not meet normal requirements or requirements may, for some reason, be higher. Both terms are used in this thesis although it may not be clear whether there is a causal relationship.

## **2.2 Assessment of nutritional status by anthropometry**

Gibson (1990) describes nutritional assessment as the process in which data from dietary, clinical, anthropometric and biochemical studies are interpreted to evaluate the nutritional status of an individual or a population. This study mainly focuses on anthropometry although limited dietary and clinical data were also collected.

Anthropometry has been defined as "measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition" (Jelliffe in: Gibson, 1990). The measurements are particularly useful to detect malnutrition in circumstances of protein and energy imbalances.

The importance of assessing relative amounts of body tissue is that adipose tissue is an indicator of the body's energy reserve and skeletal muscle tissue is an indicator of protein reserves. When these body stores are severely depleted, normal body functions may become seriously compromised. Anthropometry is an indirect method to assess nutritional status. Its merits include that it is a quick and cheap method and relatively non-invasive. At the same

time it provides considerable information. Its role in the assessment of the nutritional status of children has become essential.

Nutritional status assessment by anthropometry has been used less frequently for adults than for children, because satisfactory reference standards and appropriate cut-off points to distinguish between normal and undernourished adult individuals have been difficult to establish. The alterations in height, weight, postural changes and mobility that occur with ageing, make the interpretation of anthropometric measurements in elderly people and older adults even more difficult. Moreover, interpretation of anthropometric data in the elderly from cross-sectional studies may be problematic due to selective survivorship. Nevertheless the (change in) body composition measured by anthropometry is regarded as helpful in screening the elderly for the ability to live independently (WHO, 1998).

Age-related changes in body composition and anthropometric measurements commonly used for adults such as height, weight, skinfold thickness and circumference measurements (Lohman, 1988) will be outlined below. In addition arm measurements and kneeheight that are considered particularly appropriate as alternatives for height for older age groups, are also discussed.

### **2.2.1 Body composition changes with age**

The body composition of an elderly person may be expected to be different from that of the young adult. Lean body mass slowly but progressively decreases during adulthood along with a progressive increase in fat mass. A decline in body water, bone mass and skeletal muscle account for the largest decreases in lean body mass. Muscle tissue is replaced by intramuscular fat, and fat tends to move from limbs to trunk and from subcutaneous to intra-abdominal sites (Bowman, 1982; Schwartz, 1990; Steen & MacLennan, 1991).

However little information is available about the status of these changes at different ages. Cross-sectional studies demonstrated a striking decline in muscle strength with age and also in strength per kg body weight which is relevant for mobility (MacLennan et al, 1980; Pearson et al, 1985a, 1985b; Rutherford & Jones, 1992). Reports regarding loss of muscle size are less consistent and often based on anthropometric methods that are less accurate in the elderly and cannot discriminate between skeletal muscle and other components of fat free mass.

Moreover these studies were cross-sectional and therefore less appropriate to measure changes with age.

In the Baltimore Longitudinal Study on Aging, there was a slow progressive decrease of lean body mass until the age of 65, followed by a much faster decline, as measured by anthropometry of the arm (Roubenoff & Kehayias, 1991). Chumlea followed a group of healthy elderly people (65-89 years) for 6 years and found only small annual changes in body mass index (BMI), mid-arm circumference, mid-arm muscle and subcutaneous tissue for each sex (1989).

All these changes limit the validity of body composition methods. Moreover validated sex- and race- specific equations are still largely unavailable (Kuczmarski, 1989; Steen, 1989; Chumlea & Baumgartner, 1989; Deurenberg et al, 1989).

### 2.2.2 Weight

Body weight comprises the weight of both lean tissue and fat tissue and is a rough estimate of body energy stores. Changes in weight usually indicate a change in energy and protein balance. Recent unintended change in weight is used as a clinical pointer to risk of malnutrition in geriatric research (Fischer & Johnson, 1990). Arbitrary indicators based on weight, like more than 10% loss of usual or ideal body weight within six months, have been used (WHO, 1998). A single measurement of an individual's body mass is of limited value. It does not provide information about changes or relative amounts of body tissues and it can be confounded by dehydration or oedema. Weight monitoring is more useful and is indeed applied in clinical practice (Fischer & Johnson, 1990). Practical constraints in nutritional surveys however often do not allow for longitudinal studies.

In developed countries, body weight gradually increases with age, tends to plateau in the fourth decade in men and a decade later in women (Mitchell & Lipschitz, 1982) and later decreases up into very old age (Rea et al, 1997). Chumlea et al (1988) reported from a longitudinal study a general trend of weight loss between the ages of 60 to 80 years at a mean rate of approximately 1.0 kg per decade. Carmelli et al (1991) reported an average decrease of 0.8 kg per decade after age 50 in men. A Swedish study however showed a decrease of body weight during the eighth decade averaging 7 kg in males and 6 kg in females, which was

mostly due to a decreasing amount of extra-cellular water (Steen, 1988). Tribal Africans measured in cross-sectional studies showed no increase in weight with age as found among Europeans (Eveleth & Tanner, 1976), but a decline at more advanced age does occur (WHO, 1998).

### 2.2.3 Height

Height is the measurement of the total linear body size. Adult height is usually measured by standing height. Height as a measure of general body size is used in combination with weight as an indicator of leanness or fatness.

Both longitudinal and cross-sectional studies indicate that height decreases with age. Height loss mainly takes place in the trunk due to spinal deformities such as kyphosis (spinal curvature), vertebral compression, and change in height and shape of the vertebral discs (Wahlqvist & Flint, 1988; van Leer et al, 1992). An accurate height measurement can further be confounded by postural changes such as bowing of the legs and bent knees due to decreased muscle tone (WHO, 1995).

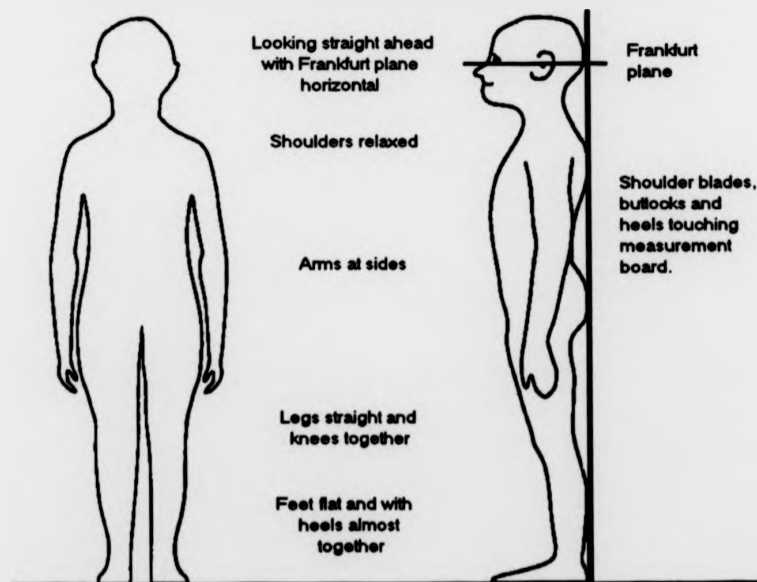
Height loss accelerates at older ages and this is most apparent in women. The rate of decline has been reported to be between 0.5 and 1.5 cm per decade, but these rates have been estimated from cross-sectional studies that may be confounded by secular trends towards increased height (Chumlea & Baumgartner, 1989). Longitudinal studies give a more reliable picture of age-related decline in height. Noppa et al (1980) reported a mean reduction in height of 0.04 cm per year in women aged 40 to 60 years, being twice as high above age 50. Carmelli et al (1991) found an average decrease in men after age 50 of 1.2 cm per decade. Chumlea et al (1988) followed 60-80 year old men and women for 6 years and found a rate of decline of 0.5 cm per year, which was much greater than previously reported estimates and mainly contributed to sample age differences. Chandler & Bock (1991) removed the secular trend by confining the analysis to individual longitudinal data. Following an adult Australian population, they found a decline in height in both sexes from the fourth decade on (age 30-40 years), which is earlier than previously determined. From the mid-40s on, women's rate of decline becomes greater than that of men, resulting in an average reduction from peak height of 6.6 cm in women and 6.0 cm in men by the age of 80 years. This sex difference is generally ascribed to osteoporosis, affecting women more than men.

**Measurement issues**

Height is measured with the subject standing erect against a wall with the heels together and the feet in at angle of 45 degrees. The back should be as straight as possible and shoulders relaxed. The Frankfurt plane (the imaginary plane that passes through the lower bones of the eye sockets and the small flap of skin on the forward edge of the ear (Gibson, 1990)) must be horizontal so that the head is raised and the subject is looking straight ahead (see figure 2.1).

Elderly people may have difficulties standing or maintaining an erect posture and some cannot stand up at all due to disease or disability. Therefore height cannot be measured accurately in non-ambulatory elderly individuals. Besides this, kyphosis, bowing of the legs or bent knees can affect an accurate measurement and may result in considerable numbers of 'missing values'.

Figure 2.1 Position for height measurement (source: Gibson, 1990)

**2.2.4 Alternatives to height**

Height is an important variable in several indices of nutritional status used for adults (weight-height ratio, body mass index, creatinine-height index). The difficulties in measuring height

pose serious problems to the assessment of nutritional status in older age groups. However, other linear skeletal measurements could be used as alternatives to height (Bassey, 1986).

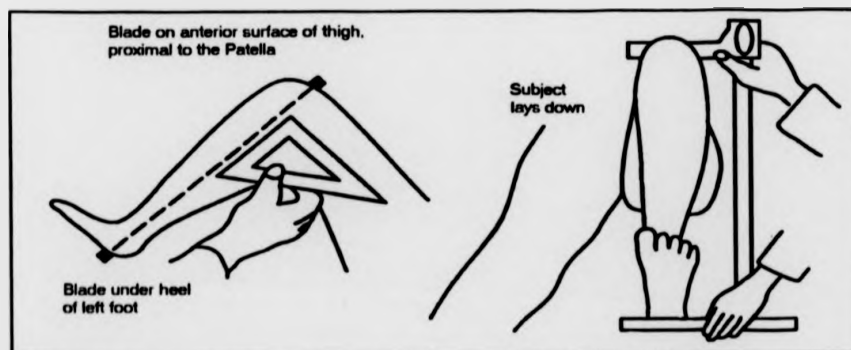
Long bones do not appear to shrink with age to the same extent as height. Mitchell & Lipschitz (1992) compared height with different arm bone lengths in young and older individuals. For each long bone measurement, the regression lines for the older age group shifted up for any given height. It was concluded that height decreases with age, but that long bone measurements of the arm do not change to the same degree.

Long bone measurements like kneeheight, armspan and demispan could therefore be a proxy for height. Although none of these measurements is faultless, they can be used to estimate height. As the different studies were not conducted in nationally representative samples, interpretation of the results and application to other groups of elderly people is cautioned.

#### 2.2.4.1 Kneeheight

Kneeheight is the distance from the sole of the foot to the anterior surface of the thigh with the ankle and knee flexed to a 90 degree angle (Churnlea, 1985) and is generally one third of an individual's height (Roubenoff & Wilson, 1993). The use of recumbent kneeheight (figure 2.2) has been recommended as a convenient and relative accurate measurement to be used to estimate height in elderly individuals who cannot stand or whose height cannot be measured due to spinal curvature (Cockram & Baumgartner, 1990).

Figure 2.2 Position for recumbent kneeheight (source: Gibson, 1990)



Chumlea et al (1987) have done most work on kneeheight and report that it is highly correlated with height ( $r = 0.82$  for men and  $0.74$  for women). They found that kneeheight was significantly and negatively associated with age in women, but the reduction was only  $0.06$  cm per year. Borkan et al (1983) found smaller decreases in kneeheight between the ages of 45 and 75 years for men in the Boston Normative Aging Study (average of  $0.28$  cm per decade).

Chumlea & Guo (1992) presented equations to estimate height from kneeheight derived from a small black American sample. They continued the study later and presented better equations for non-Hispanic black Americans, based on much larger samples (Chumlea et al, 1998). Cockram & Baumgartner (1990) found a significant negative association with age in both sexes, but their sample was very small ( $n = 40$ ) and constituted white elderly. Kneeheight and age predicted height with average errors ranging from  $1.9$  to  $2.6$  cm in men and women, an amount not likely to substantially affect nutritional indices that include height. However some individual differences were large.

#### *Measurement issues*

Recumbent kneeheight is measured with a sliding broad-blade calliper when the subject is supine. There is limited information about measurement error for kneeheight in the elderly. Chumlea et al (1985) found that inter-observer errors for recumbent kneeheight are small and compare well with those for height. Although no systematic differences between corresponding values for recumbent and sitting measurements of kneeheight were found, mean absolute inter-observer errors for recumbent measurements were one third as large as corresponding errors for sitting measurements of kneeheight.

Chumlea et al (1985) compared arm length, ulnar, thigh and tibial lengths with kneeheight and found that kneeheight correlated better with height than the other measurements. Moreover, inter-observer reliability of the kneeheight measurement was higher than reliability of the other measurements. Some prefer kneeheight as a proxy for height rather than any of the arm measurements, as kneeheight is a component of height and avoids the problem of reduced mobility in shoulder and arms that older people may have.

### 2.2.4.2 Armspan

Armspan is the distance between the tips of the middle fingers of each hand when both arms are extended laterally and maximally to the level of the shoulders with the palms facing forwards (Lohman, 1988). Armspan is assumed to be approximately equal to height in young adulthood (Hibbert, 1988). Like kneeheight, armspan has therefore been recommended as a practical and reliable estimate of height (Kuczmarski, 1989; Steele & Chenier, 1990; Kwok & Whitelaw, 1991).

Armspan is highly correlated with height and changes little with age. Kwok & Whitelaw (1991) reported in both young adults and elderly a correlation coefficient of 0.93 between armspan and height. Mitchell and Lipschitz (1982) studied the relation between different arm segment lengths with age and came to the conclusion that arm length measures do not significantly decrease with age. However Borkan et al (1983) reported an increasing decline in armspan between the ages of 45 and 85 years (average of 1.19 cm per decade).

Whilst armspan may be a practical measure to estimate height, it is necessary to establish the relationship between height and armspan in different ethnic groups. Differences between means of armspan and height have been observed to be larger in black than in white adults (McPherson et al, 1978).

Steele & Chenier (1990) found that armspan exceeded height by 8.7 cm for black women and 3.3 cm for whites and the correlation coefficients were 0.852 and 0.903 respectively. Similar race differences in the relationship between armspan and height were presented in an earlier study among younger females (Steele & Mattox, 1987). Armspan and height in the referred studies were more highly correlated than arm length<sup>1</sup> and height reported by Mitchell & Lipschitz (1982). Comparing the 90% error boundaries for height predicted from armspan and age reported in Steele & Chenier's study ( $\pm 0.17$  cm for blacks and  $\pm 0.15$  cm for whites) with those for height predicted by kneeheight ( $\pm 5.28$  cm) reported by Chumlea (1985), it appears that armspan is a more accurate predictor of height.

---

<sup>1</sup> Measured from the tip of the acromial process of the scapula (tip of the shoulder) to the end of the styloid process of the ulna (wrist).

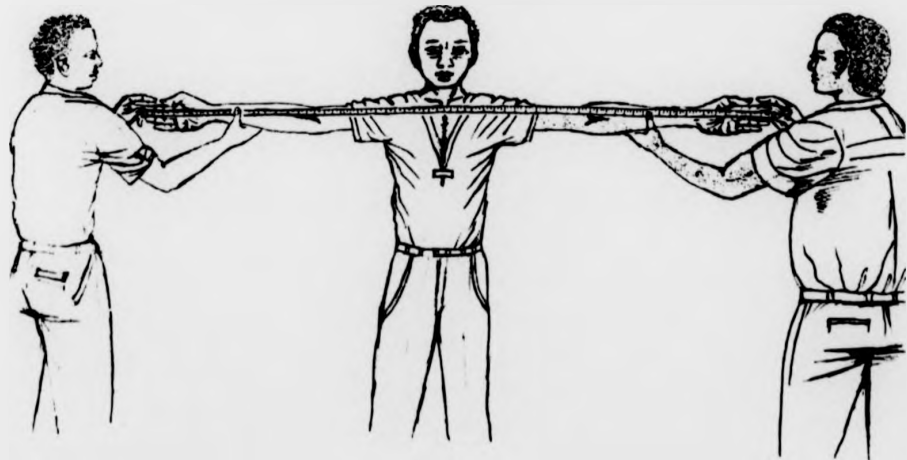


In a recent study among young males of Afro-Caribbean, Asian, Caucasian and Oriental ethnicity, good correlations were found between armspan and height. A clear difference was however observed between ethnic groups, the Afro-Caribbean group exhibiting the greatest deviation away from the assumed 1:1 ratio (Reeves et al, 1996). Steele & Chenier (1990) derived race-specific regression equations to predict height that included age and armspan.

### *Measurement issues*

Two observers are necessary to measure armspan, one at the zero end of the tape and one at the block end to take the reading (figure 2.3). It is crucial that the subject's arms are outstretched maximally and horizontally and that the wrists are kept in a neutral position during the measurement, which can be difficult for elderly people. Also alterations in chest measurements by lung disease and severe cases of kyphosis, osteoporosis and reduced joint mobility may confound armspan measurements. However these conditions do not always affect the ability to pose well for the armspan measurement. The inter-observer error estimated by Chumlea (1983 in: Lohman, 1988) is 0.56 cm for men and 0.38 cm for women.

Figure 2.3 Position for armspan measurement (by Deo Babili)

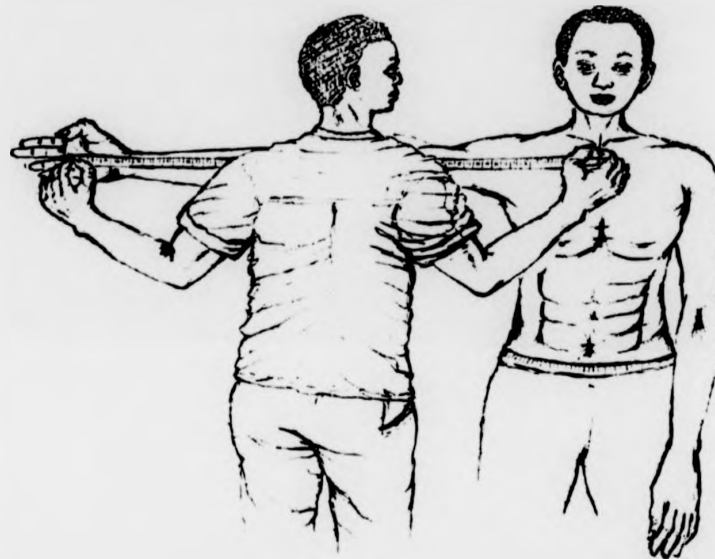


#### **2.2.4.3 Demispan**

The demispan measurement has been developed by Bassey (1986) as an alternative to armspan. It is defined as the distance between the finger roots and the sternal notch with the arm outstretched laterally (figure 2.4). The measurement of demispan has recently been

included in surveys among elderly people in the U.K. (Kwok & Whitelaw, 1991; Lehman et al, 1991) and in former Yugoslavia by the WHO (Vespa, 1995). Lehman et al (1991) presented mean values for demispan from a large, representative group of community living elderly.

Figure 2.4 Position for demispan measurement (by Deo Babili)



Like kneeheight and armspan, demispan is also reported to change considerably less with age than height. Bassey (1986) found highly significant correlations between height and demispan ( $r = 0.75$  for men and  $0.74$  for women,  $P < 0.001$ ) in normal young and middle aged subjects. Correlations between height and arm length measured in a sub-sample were lower. The ratio of height to demispan was approximately 2. In a large, representative group of community living elderly that participated in the Nottingham Activity & Ageing Survey, demispan only fell by 1% per decade (Lehman et al, 1991).

Demispan can be used in a weight for height index, as it is also a linear skeletal dimension. Like BMI, the index must be independent of height. Taking this criterion into consideration, Lehman et al derived different indices for men and women from the measurements of body weight and demispan: demiquet and mindex. Demiquet is weight divided by the square of

demispan ( $\text{kg/m}^2$ ) which was used for men, and mindex is the simple ratio weight over demispan ( $\text{kg/m}$ ) for women. Both indices had a weak negative association with age.

Major advantages of a demispan measurement compared with total armspan are that it avoids possible problems associated with kyphosis and difficulties the elderly may have in stretching out their arms. The number of joints included is less than for armspan and a single observer is able to take the measurement (Bassey, 1986). Demispan measurements can even be taken from bed- and chair-ridden persons and those with fingers deformed due to arthritis.

#### *Measurement issues*

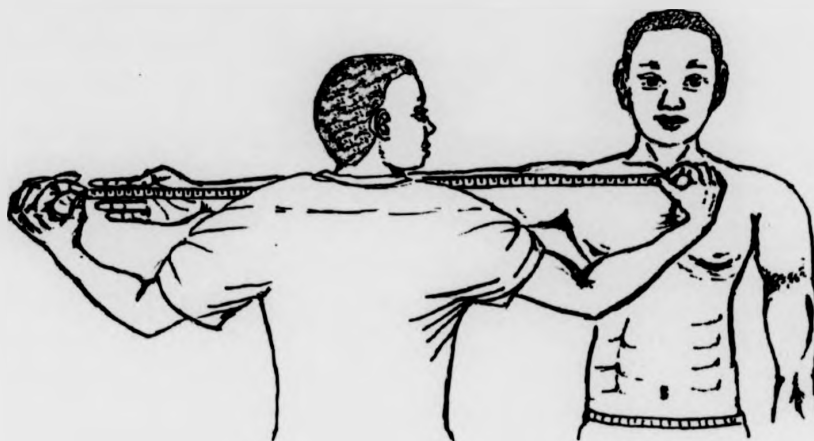
Demispan is measured with a simple tape. The tape is secured between the middle and ring fingers of the left arm. The arm is then extended maximally to the lateral side with the wrist kept in neutral position. The proximal end of the measurement is the edge of the right clavicle in the sternal notch (Bassey, 1986).

Bassey (1986) expressed the reliability of replicate measurements as the standard deviation and standard error of two paired measurements. The intra-observer standard deviation and error for demispan were respectively 0.27 cm and 0.190 cm, and the inter-observer deviation and error were 0.30 cm and 0.212 cm. The author concludes that the reliability of the demispan measurement is good and similar to that of height. No significant difference was found between measurements obtained in seated and standing position. Lehman et al (1991) reported an inter-observer variation of less than 2% for demispan in the Nottingham Activity and Ageing survey.

#### **2.2.4.4 Halfspan**

Kwok & Whitelaw (1991) described halfspan as the distance from the centre of the sternal notch to the tip of the middle finger (figure 2.5). This measurement can be taken when the armspan measurement is difficult due to limited movement of the shoulder or elbow. It was found that armspan could be estimated by doubling halfspan either in an erect or recumbent position. Halfspan (recumbent) was shown to be reproducible.

Figure 2.5 Position for halfspan measurement (by Deo Babili)



Although halfspan includes more joints than demispan and therefore could involve more measurement errors, halfspan multiplied by two can directly be used in the BMI which is still the most commonly used index. However this statement is probably not true for populations other than Caucasians.

#### 2.2.5 Body Mass Index

The body mass index (BMI) was developed out of interest in an index of weight that is independent of height and may in turn be related to body fatness. BMI is defined as the ratio of weight (kg) over height squared ( $m^2$ ) and is widely used for adults. The index correlates highly with weight and has been reported to be consistently independent of height (Micozzi et al, 1986; Shetty & James, 1994). In developed countries, a decrease in average BMI after 70-75 years of age is generally seen (WHO, 1998).

Focus has been on BMI as a measure of fatness and the association with morbidity and mortality (Deurenberg et al, 1989; Tuomilehto, 1991). However there is not yet much experience in its application to relatively lean populations in developing countries. It is only recently that adult BMIs have been considered as a valuable index of public health in developing countries. James et al (1988) suggested that the use of BMI could be a simple, reliable and easily obtainable objective anthropometric criterion for both the definition and diagnosis of the severity of undernutrition and chronic energy deficiency in adults.

Table 2.1 shows the cut-off points proposed to define Chronic Energy Deficiency (CED) in adults (James et al, 1988). However these were based on anthropometric data from white, young army recruits and their validity in populations of different ethnicity was questioned. The usefulness of the proposed classification system was therefore tested in two African and an Indian population. It was concluded that BMI alone is sufficient to assess adult CED rather than in combination with physical activity levels (Ferro-Luzzi et al, 1992). Nevertheless the cut-off point of 18.5 kg/m<sup>2</sup> to distinguish normal body weights from underweight was reconsidered. Although its limitations were acknowledged, it was recommended to adhere to it for the time being (James & François, 1994). It was noted that the mean BMI in western populations ideally should be in the 21-23 range so as to avoid high prevalence of overweight, but mean values for third world men and women of 23 kg/m<sup>2</sup> and 24 kg/m<sup>2</sup> respectively were mentioned to ensure adequate working capacity, taking into account higher customary activity levels.

Table 2.1 Epidemiological diagnosis of Chronic Energy Deficiency (CED)

BMI	Diagnosis
≥ 18.5	normal
17.0 - 18.4	CED grade I
16.0 - 16.9	CED grade II
< 16.0	CED grade III

Source: James et al, 1988

Apart from its applications in CED, the discussion on BMI centres around a variety of issues related to body composition and body proportions (Garn et al, 1986). The latter mainly concerns the leg length relative to trunk. Based on data from relatively long legged Australian and African populations, it was noted that the prevalence of CED will be overestimated if BMI is not adjusted for sitting height (Ritmeijer, 1990; Norgan, 1990, 1994a,b,c). Given the fact that the correlation between BMI and height is only very moderate, the WHO concluded that BMI may be considered as essentially independent of height except for extreme tall and short individuals (WHO, 1995).

Regarding BMI and body composition, Gallagher et al (1996) concluded from a study among black and white New York inhabitants (20-94 years) that there is a strong influence of age and sex but not of ethnicity on the relation between BMI and body fat.

Thus at any given BMI value, older people and women have a higher fat percentage than younger people and men respectively. Moreover the age related increase in fatness in relation to BMI was independent of height loss. However Wang et al (1994) reported a contrasting finding regarding BMI and ethnicity, and Immink et al (1992) found that BMI did not explain a high proportion of the variation in body fat and fat-free mass as estimated by densitometry in young and middle age rural adults living in Guatemala.

In older people BMI based on armspan was found to be smaller than BMI based on height. The mean difference between BMI by height and armspan was  $1.79 \text{ kg/m}^2$  (SD 1.11) in Caucasian Americans (Kwok & Whitelaw, 1991) and 1 to 3 units in Italians (D'Amicis & Ferro-Luzzi, 1992). Manandhar (pers. com. 1995) and Rabe et al (1996) reported similar findings: the prevalence of undernutrition based on BMI-armspan was higher than that based on BMI-height in older urban Asians. The increase was 12% for women and 9% for men among Indonesians and 16% and 19% respectively among Indians. The optimal use of BMI using armspan requires its own population norms.

#### 2.2.6 Skinfolts

Skinfold thickness provides a relatively simple and non-invasive method of estimating general fatness. This anthropometric measure has been used in different populations for a long time. The extent to which subcutaneous adipose tissue reflects the body's fat reserve varies with age as well as among individuals and populations. As a result of redistribution of fat from limbs to trunk with increasing age, subcutaneous limb skinfolts tend to underestimate the percentage body fat in the elderly. Moreover, the amount of intra-abdominal fat and replacement of muscle tissue by fat tissue is not reflected in a subcutaneous fat measurement.

The predictive value of skinfold thickness for total body fat also varies by site, with some sites closely related to overall body composition and others relatively independent of it. In elderly subjects sub-scapular and supra-iliac skinfolts proved to be the best predictors of fat stores in men, while the triceps skinfold and thigh measurements were of greater value in women (Lipschitz, 1992).

Apart from the changes related to fat mass and distribution, changes in elasticity, hydration and compressibility of subcutaneous and connective tissues in the elderly can account for an

altered relationship between skinfold thickness and body composition. Thus skinfold measurements must be interpreted with caution. Another difficulty in interpretation is the relative lack of validated equations for predicting total body fat in the elderly in general and African elderly in particular.

### *Measurement issues*

Skinfold thickness is measured by grasping the skin and adjacent subcutaneous tissue between thumb and forefinger, shaking it gently to exclude underlying muscle, and pulling it away from the body just far enough to allow the jaws of the calliper to impinge on the skin. Because of the pressure of the jaws of the calliper ( $10 \text{ g/mm}^2$ ), the tissues get compressed and the calliper reading diminishes rapidly during the first few seconds. The reading is taken at the end of the rapid decrease (after approximately 3 seconds) (Lohman, 1988).

The precision of a skinfold measurement depends on the skills of the measurer and the thickness of the skinfold. In general a precision within 5% can be achieved easily by a trained and experienced measurer. Very large ( $>15 \text{ mm}$ ) or small ( $<5 \text{ mm}$ ) skinfolds can increase the error slightly. The error in estimating percentage body fat will range between 3 and 9% (Lukasi, 1987). Compared to younger adults, older adults have more frequent and larger inter-observer errors, especially for skinfolds and circumferences on the trunk (Chumlea et al, 1984).

### **2.2.7 Circumferences**

Undernutrition in adults involves a loss of both cell mass and fat mass. There is evidence that lean tissue reduction (including muscle) is initiated first in moderate undernutrition (Barac-Nieto & Spurr, 1978), and that muscle mass reduction is greater than that of visceral mass in chronic adult undernutrition (Shetty, 1995). Therefore measurements of muscle mass might be a more sensitive index of tissue atrophy than low body weight. Calf and mid-upper arm circumference can be used as measures for peripheral wasting. In combination with skinfold thickness they can be used to calculate muscle mass.

Studies in western societies reported a significant negative correlation between age and calf circumference in elderly men but not in women (Chumlea et al, 1984). This may well be due to a general loss of muscle in response to men's reduced physical activity after retirement. Calf

circumference is considered the most sensitive measure of muscle mass in the elderly as it better indicated changes in fat free mass with decreased activity in western men (WHO, 1995, 1998).

### *Measurement issues*

Mid-upper arm circumference (MUAC) is measured midway between the tip of the acromion and olecranon process with the arm hanging relaxed besides the body. Calf circumference is obtained in the same position as kneeheight at the level where the reading is maximal.

### *MUAC as screening tool in adults*

To date adult malnutrition is usually defined by BMI. However attempts are being made to see whether MUAC and its derivatives may substitute for BMI and thereby simplify population screening. Adult data from nine developing countries show that MUAC and BMI were highly correlated. Although MUAC could substitute for BMI in the severely malnourished and normal groups, it did not discriminate usefully in the intermediate group (James et al. 1994). The authors propose a new classification of grades I, II and III of chronic energy deficiency based on both BMI and MUAC which provides a better means of discriminating at-risk underweight adults from those who are normal but vulnerable.

In response to the demand for simple screening methods to identify those in need for supplementary feeding in emergencies, Ferro-Luzzi & James (1996) identified MUAC cut-off points based on the same international aggregated data set. Sex-specific MUACs corresponding to BMIs of 16, 13 and 10 kg/m<sup>2</sup> were suggested to be suitable for rapid screening.

MUAC has also been found to be useful in assessment of nutritional status of severely malnourished adults in Sudan. These data show a close correlation between MUAC and BMI in severely malnourished adults ( $r = 0.86$ ). MUAC measurements have considerable practical advantages over BMI. MUAC is quick and easy to measure which is especially important in unstable situations, and is not confounded by lower body oedema or ascites (Collins, unpublished a).



### **3. Functional ability assessment in older people**

In children, poor nutritional status has been linked to increased morbidity and mortality. However in ageing research, there has been a shift of focus from mortality and longevity to health status and quality of life. From the perspective of older people, quality of life judged by their level of functioning and ability to remain independent for as long as possible is at least as important. An increasing life expectancy and shift from communicable diseases to chronic and degenerative conditions, puts persons at risk of suffering from non-fatal, disabling conditions in old age (Rudberg et al, 1992). Especially women and the poor have a longer than average duration of expected disability which will adversely affect their quality of life (Katz et al, 1983). As Kuczmarski (1989) stated "there is a need for greater knowledge of the associations between body composition and functional capacity and the quality of life".

Despite the fact that many elderly people suffer from chronic conditions, most of them value their independence highest. Antilla quoted from Heikkinen (1993) that "most elderly want to live at home as long as possible". Finnish dependent elderly living at home took measures such as improving housing standards, availability of home care and home health services and moving to town centres (Antilla, 1991), indicating the importance of independence for the quality of their lives. A survey among elderly patients in long-stay wards showed that 46% of those interviewed considered that physical dependence was the worst thing about being admitted (Higgs et al, 1992). Functional and emotional limitations have been found to be correlated with a lower quality of life among elderly from different developing countries (Lamb, 1996).

Functional ability can be defined as the ability to perform basic daily activities without assistance. An individual's ability to function independently accounts for significant aspects of the quality of life and is therefore important in the evaluation of older people who generally suffer more functional losses than younger people. Functional ability is not only important in terms of having control over one's life, but also in terms of the ability to contribute to household and economic activities. Functional ability could therefore be a valuable outcome variable against which to measure nutritional status (Vespa, 1992; Manandhar, 1995).

Heikkinen (1993) distinguished between functional capacity and functional ability. Functional capacity assesses an individual's maximal competence and does not explicitly predict the

ability to cope with the tasks of daily living. Functional ability, on the other hand, refers to the part of functional capacity that is related to essential activities of daily life. Functional ability impairment means a decreased ability to meet one's own daily needs. According to the WHO definition, impairment reflects disturbance at the organic level, whereas disability and handicap refer to the personal and social level respectively (WHO, 1980). Verbrugge & Jette (1994) clarify that for instance weak handgrip strength and finger flexion (impairments) cause difficulty in grasping and rotating objects (functional limitations), that lead to problems opening jars or doors (disability). However in this case disability can be reduced by interventions such as kitchen devices and special door handles.

Functional ability is commonly rated in terms of daily routine activities, mobility and physical tests. Other domains of functioning that are considered important in evaluating older people are cognitive, psychological, social and sensory function and these are highly interrelated (Fillenbaum, 1990; Guralnik & Lacroix, 1992). Various dimensions of functional ability will be discussed in this chapter, beginning with two categories of daily activities: Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL).

### **3.1 Activities of Daily Living**

Activities of Daily Living (ADL) are concerned with self-care capacity and are considered to be the most significant area in personal functioning related to physical, mental and social well-being (Fillenbaum, 1984). They have been defined as a "set of common everyday tasks the performance of which is required for personal self care and independent living" (Weiner et al, 1990). ADL scales are commonly used in institutions and research to measure physical functioning and rehabilitation. The Katz and Barthels scale are the most widely used, with the Katz scale regarded as being one of the best ADL scales (Law & Letts, 1989).

The Katz ADL scale explores six basic activities, arranged hierarchically in order of ascending difficulty: eating, continence, transferring, toileting, dressing and bathing. The ordering reflects the developmental pattern found in childhood and the stages of recovery in disabled patients (Katz et al, 1970, 1976), although this particular order and inclusion of continence has been questioned (Fillenbaum, 1996). An individual is either rated independent (able to perform the activity unassisted), partially dependent (requiring little active assistance) or

totally dependent (requiring personal assistance, directions or supervision). Assessment takes place by self-report and a summary score indicates overall performance.

### **3.2 Instrumental Activities of Daily Living**

Instrumental Activities of Daily Living (IADL) look at a more complex set of self-care functions essential for independent living in the community (Lawton & Brody, 1969; Fillenbaum, 1996). It involves activities such as travelling, shopping, handling money and doing housework. There is a strong association between ADL and IADL. Impairment in IADLs usually precedes that in ADLs; a substantial proportion of older persons dependent in IADLs have been reported to develop dependence in ADLs within 1-2 years time (Spector et al, 1987). IADL dependency represents less severe dysfunctioning. Thus ADL combined with IADL is likely to be a more sensitive measure of functional decline than ADL alone.

It is remarked that the use of IADLs has some limitations as they are culturally, gender and sometimes seasonally biased (Fillenbaum, 1984, 1985; Vespa, 1992). This was confirmed by Manandhar (1999) in her study among elderly in Mumbai slums. Jitapunkul et al (1994) had similar experiences in Thailand: western ADL scales, especially the IADL, were proved to be culturally bound and inappropriate for use in this population. IADL functions represent activities that must be adapted independently to the environment. The situation in unstable situations might be so different that assessing IADLs becomes irrelevant.

Unfortunately well-validated and reliable ADL and IADL scales are scarce (Fillenbaum, 1984, 1985; Feinstein et al, 1986; Manandhar, 1995), but there is more uniformity and consensus on assessment of ADLs than of IADLs (Wiener et al, 1990). Nevertheless, self reports are generally considered to give a reasonable estimate of functioning that can be obtained relatively easily and quickly. There is evidence that functional assessment instruments including self reports identify more accurate levels of functional impairments in elderly people than do judgements by physicians or nurses (Elam et al, 1991).

### **3.3 Physical performance tests**

An important addition to self-report instruments was the development of performance measures of physical function. These are tests that offer a more objective and quantifiable

performance measure. Individuals are actually asked to perform specific tasks and are evaluated using standardised criteria. Limited methodological work has been done on physical performance tests and no standard validated set of tests to measure function is available. Functional ability comprises numerous dimensions that can be grouped into mobility, manual ability, flexibility, muscular strength, psychomotor skills and cognitive function. Physical performance tests have been developed accordingly.

Physical tests are assumed to be more objective, reproducible and sensitive to change than self-reported measures. However performance also depends on motivation of the subject, encouragement by the measurer and even psychological and socio-demographic factors (Kaplan et al, 1996; Kempen et al, 1996). Moreover testing may be time-consuming, standard values are non-existent, and every test measures only one dimension of function whereas self-reported measures often provide a more general assessment of function (Guralnik et al, 1989). Nevertheless physical test performance and ADL assessment have been used in previous investigations and provided useful information even in modified versions (Branch & Meyers, 1987). Self rated measures of function and health have been recommended in combination with performance-based measures since they are complementary rather than contradictory (Wolinsky et al, 1984; Kempen et al, 1996). Physical performance tests include tests of mobility, range of motion and flexibility, psychomotor function and muscle strength.

### **3.3.1 Mobility**

Mobility is defined as the ability to get around in one's environment and is an essential aspect of quality of life. A decline in mobility is seen with ageing and is associated with musculo-skeletal, neurologic, sensory and cognitive characteristics (Tinetti, 1986). Mobility limitation is a major risk factor for ADL disability, particularly if multiple mobility problems exist (Clark et al, 1998). Apart from the direct consequences of impaired mobility to daily life, it is a strong risk factor for falls (Graafmans et al, 1996; Vellas et al, 1998) which in turn affects confidence that may lead to a restriction of activities. A strong independent association has been found between function and the confidence a person has in performing common daily activities without falling (Tinetti et al, 1994b). Tinetti & Williams (1998) concluded that falls and fall injuries appear to be independent determinants of functional decline (ADL and IADL performance, social and physical activities) for both short and long

periods of follow-up, and the amount of decline increased with the number of falls and the severity of injuries. It has been demonstrated that intervention in areas of physical and medical adaptations and confidence building significantly reduced the risk of falling among elderly persons in the community (Tinetti et al, 1994a). As mobility problems were associated with poorer strength, maintenance of adequate strength in older people has also been suggested to be favourable to mobility (Rantanen et al, 1994).

Decreased mobility is probably the most common functional impairment associated with malnutrition (Institute of Medicine, 1990). Poor mobility can affect nutritional status by reducing a person's access to food. Conversely, poor nutritional status and changes in body composition are associated in the elderly with an increase in balance and gait problems and risk of falls.

Mobility and gait can be assessed by self-report such as in Rosow & Breslau's gross mobility activities and Nagi's physical limitation scales (Tinetti, 1986) or by observation in several activities like walking or climbing stairs. In addition, performance tests have been developed to assess mobility and balance such as timed walk tests, one leg stand and tandem stand.

### **3.3.2 Range of motion and flexibility**

Flexibility of the shoulder joint decreases with age and is associated with disability in self-care functions such as grooming and dressing. Loss of flexibility may be caused by stiffness of collagen and lack of use (Bassey et al, 1989b). Range of motion can be measured with specialised equipment or simple exercises such as internal and external shoulder rotations (NHANES III). Bassey et al (1989a,b) measured the range of shoulder movement quantitatively and found that more than half of the representative sample aged 75 years and above had values lower than considered to be necessary for normal functioning. Values in both sexes were lower than those found in young subjects and the age related decline was more marked in women. Impaired flexibility was partly explained by reported health problems, use of arm and shoulder and handgrip strength and more so in women.

Hand functions are relevant for self care activities such as eating, dressing and personal hygiene and for domestic tasks such as food preparation and cleaning. Various timed tests involving handwriting and opening and closing different fasteners including a lock and key,

have been developed to assess manual dexterity. Williams and colleagues have done important work in demonstrating that decline in hand movement is an important correlate of functional dependency. Poor manual dexterity was related to ADL-dependency, but also found to be a strong predictor of death (Williams et al, 1982, 1994). The relationship remained after controlling for age, sex, race, medications and IADL-dependency. Ostwald et al (1989) also controlled for confounding social and environmental factors and confirmed that manual dexterity can be used as an objective measure of the ability to cope with daily activities necessary for independent living. More recently a longitudinal study suggested that upper extremity joint impairment may be an important risk factor for future functional impairment (Hughes et al, 1997).

### **3.3.3 Psychomotor function**

Psychomotor function refers to the performance of the brain in controlling movement involving motor coordination and reaction. Psychomotor speed has been reported to decrease with ageing and a direct relationship between physical fitness and reaction time was found (Houx, 1991). Spirduso (1980) stated that there are strong indications that, compared with controls, psychomotor speed is higher in physically fit individuals, previously unfit groups who have undergone physical training regimes, those who are free from cardiovascular diseases (e.g. hypertension). A relationship between fitness and psychomotor speed performance would mean that physically trained older people may maintain better ability to function independently.

Tests of psychomotor function are devised to measure the time elapsed between the initiation of the movement and the actual movement. The plate-tapping test (plate 3.1) is favoured as its performance depends entirely on psychomotor skill and not on strength. One hand is moved from one end of a table to the other, while the other hand remains in the middle.

Plate 3.1 Plate tapping test



### 3.3.4 Muscle strength

Declining muscle strength has been strongly associated with age and a lack of muscular power undoubtedly affects the functional ability of elderly people (Webb et al, 1989; Kallman, 1990; Bassey et al, 1992, 1993; Ensrud, 1994). Muscle strength seems one of the most essential prerequisites for independence and mobility in the elderly, although not all evidence is supportive (Shizgall et al, 1986).

Skeletal muscle function has been shown to be a useful indicator of nutritional status of surgical patients. It is believed that hand performance integrates multiple types of functioning and it has performed well in predicting dependency and use of formal services. However hand performance comprises many tests and therefore cannot be easily incorporated in field studies. Handgrip strength is better suitable for this purpose, although it does not capture the same range and breadth of functioning (Hughes et al, 1997).

Handgrip strength has been used successfully to predict post-operative complications and death (Klidjian et al, 1980; Milne & Maule, 1984; Phillips, 1986; Guo et al, 1996), even in older people who normally have a lower grip strength than younger people (Webb et al, 1989). A decline in grip strength is also associated with increased risk of falling and reduced manual dexterity. Furthermore a correlation has been demonstrated between ADL-reduction and muscle strength in hand and leg and between ADL-reduction and fine motor hand function (Gosman-Hedström et al, 1988; Jette et al, 1990). Vaz et al (1996) suggested that handgrip strength may be a useful nutritional status indicator particularly where anthropometric measurements fail to distinguish undernourished from underweight persons.

The most common assessment methods for different muscle groups are handgrip strength for upper extremities and quadriceps and hamstring strength for lower extremities (Vespa, 1992). Sophisticated equipment exists, which is not always suitable for use in community studies. A handgrip dynamometer (plate 3.2) has been proven to be a suitable instrument for measuring handgrip strength in the community (Manandhar, 1995). Quadriceps strength and endurance is often measured by the repeated chair stand test (timed chair rises). This simple and inexpensive test has been proven to be reproducible and rapid and correlates strongly with age (Csuka & McCarty, 1985). An association has been demonstrated between lower extremity muscle strength and performance in chair rises (Skelton et al, 1994; Brown et al, 1995).



Plate 3.2 Handgrip strength measured with a dynamometer



Loss in hand function is a musculo-skeletal impairment that influences performance in basic ADLs, whereas lower extremity impairments play a significant role in the more complex daily activities (Jette et al, 1990; Wolfson et al, 1995). Judge et al (1996) found, after correction for potential confounders, a stronger than expected association between IADL impairment and poor performance in handgrip strength, chair stands, balance and gait velocity. There is even evidence from an initially healthy cohort of Japanese-American men that handgrip strength predicts functional limitations and disability 25 years later (after adjusting for multiple confounders). Rantanen et al (1999) reported that those with greater strength during midlife remained stronger in old age, which was attributed to their greater reserve of strength regardless of chronic conditions that may develop.

Bassey (1999) reported a modest but significant loss of handgrip strength (<5%) over an 8-year period in a representative sample of older people. A causal link was suggested with decreased physical activity and increased depression. Although on population level

muscle strength generally decreases with age, considerable individual variation is seen (Bassey et al, 1989a; Seeman, 1994; Skelton et al, 1994). In contrast to decreasing physical performance in old age, maintained levels or even improvement in muscle strength and physical performance over time have also been reported in individuals (Bassey & Harries, 1993; Seeman, 1994; Beckett et al, 1996; Anderson et al, 1998). Although ageing is usually associated with a reduction in maximal aerobic power and muscle strength (Åstrand, 1992), older people involved in regular exercise are more successful in retaining postural balance, muscular strength and endurance (Liang & Chumlea, 1998). Furthermore older people appear to remain responsive to training in the sense that they can improve their performance (Fiatarone et al, 1990, 1994; Grimby, 1995). Observations on men's sports events suggest that strength deteriorated faster with ageing than stamina (Moore II, 1975).

It has been suggested that diminished use accounts for much of the loss in strength (Rikli & Busch, 1986; Bassey et al, 1989a,b; Bassey & Harries, 1993; Grimby, 1995). However less strength at older ages in healthy, active elderly has also been observed indicating true age-related changes (Frontera et al, 1991; Skelton et al, 1994). Grimby & Saltin (1983) and Rutherford & Jones (1992) also stated that lack of physical activity alone is unlikely to explain the loss of muscle size and strength. Other attempts to explain the causes of age-related decline in muscle mass and strength include the loss of fibres and various forms of altered muscle function (Lexell, 1995), however the issue remains largely unresolved. Results of Frontera et al (1991) suggest that age- and gender- related differences in strength are likely to be caused by differences in muscle mass rather than altered muscle function, but Kallman et al (1990) found no relationship between the rates of decline in muscle mass and strength. Thus there remain yet undetermined factors beyond declining muscle mass to explain some of the loss of strength seen with ageing.

### **3.4 Nutritional status and functional outcome**

Anthropometric indicators are only of operational value if they have functional significance by identifying risk of impaired function or higher morbidity or mortality. In contrast to the emphasis on the relationship between high BMI and morbidity and mortality, similar relationships for low BMI are relatively lacking especially for developing countries. Little research has been done on the functional impact of low BMI except for working capacity.

physical activity levels and pregnancy and lactation. Being underweight has been found to be associated with lower activity levels and limited productivity. François reported that below a BMI of 17 kg/m<sup>2</sup> Rwandan women were more likely to be ill and more frequently confined to bed. Their ability and willingness to engage in heavy work was also greater above a BMI of 18.7 kg/m<sup>2</sup> (Shetty & James, 1994). Similarly among Bengali men, work-disabling morbidity was significantly greater below the BMI 'threshold' of 17 kg/m<sup>2</sup> (Pryer, 1993).

Body functions become considerably compromised in severe undernutrition. Among other outcomes this results in increased susceptibility to disease, thus infectious diseases are likely to occur more in the undernourished (Fischer, 1990). Ageing and undernutrition exert cumulative effects on immuno-competence and the positive effect of nutrition on immunity has been demonstrated (Roebathan & Chandra, 1994; Lesourd, 1997; Chandra, 1997). Among young adult samples of four developing country populations Garcia & Kennedy (1994) only found evidence in two that illness predisposed for low BMI. Nevertheless morbidity and mortality risk appear to increase rapidly for extreme low and high BMI values, although not all studies controlled for pre-existing disease (Campbell et al, 1990; Fischer, 1990; Shetty & James, 1994; WHO, 1995). A protective effect of a higher BMI in old age has also been suggested (Matilla et al, 1986; Potter, 1988).

A number of studies indicated that a BMI around 11-12 kg/m<sup>2</sup> appeared to be the lower limit of survival (Henry, 1990). Data collected during World War II have shown that in starvation, a loss of more than 40% of one's normal lean body mass is fatal and the same seems to apply to normal ageing (Roubenoff, 1991). There are however data available indicating that, under certain circumstances, a BMI of less than 10 kg/m<sup>2</sup> is not yet fatal. BMI values as low as 8.7 and 10.1 kg/m<sup>2</sup> were found for younger adults and older adults respectively in Somalia (Collins, unpublished b) and similarly low adult BMIs have been reported from the Sudan (Collins, 1993).

In addition to the demonstrated relationship between anthropometric measurements and increased risk of death, a similar relationship between mortality and overall self-rated functional ability (comprising ADL, IADL and dimensions of mobility) has also been suggested (Koyano et al, 1989; Rozzini et al, 1991; Bernard et al, 1997). The effect

remained significant even after controlling for age, sex, medical conditions, functional status and access to assistance from others (Bernard et al, 1997).

However, relating nutritional status to morbidity and mortality may de-emphasise the aspect of 'quality of life' compared with functional ability as outcome indicator. Moreover, mortality is relatively imminent for older people and both the long and short term causes of morbidity (disease, diet, lifestyle) will be hard to disentangle (Manandhar, 1995). Physical fitness and work performance will also have decreased as a result of both physiological and behavioural changes. Thus some other functional outcome of significance must probably be used with older adults. The ability to function independently in basic activities of daily life will be the main concern of older adults as they struggle to maintain their quality of life. Therefore the focus of research appears to be shifting from mortality and morbidity to the measurement of active and disability-free life expectancy. The presence of a relationship between nutrition and functional status would suggest a potentially modifiable factor for the enhancement of (functional) well-being in the elderly. The WHO (1995, 1998) also recognised the practical significance of functional ability against which to measure older people's nutritional status.

Several dietary intervention studies by Hyatt et al (1990) showed that the relationship between functional impairment and nutritional deficiency is plausible. Russell et al (1983a,b) and Lopes et al (1982) carried out studies among anorexia nervosa patients, malnourished patients with various gastro-intestinal disorders and obese subjects. Although the studies were very small, all confirmed abnormal muscle function during fasting that returned to normal after refeeding. Castaneda et al (1995) followed twelve older women who were fed a weight-maintenance diet either low or adequate in protein for nine weeks. Women on low protein diets lost lean tissue, and were compromised in muscle function and immune response. Moreover, changes in the latter two occurred earlier than body composition changes. Although the scale of the study was very small, these findings may indicate that an inadequate diet compromises functional capacity.

Fiatarone et al (1994) studied the effect of lower extremity exercise training and multi-nutrient supplementation on people over 70 years. Training improved muscle strength and size (the first to a higher extent) and was accompanied by improved mobility and increased spontaneous activity. In contrast, nutrient supplementation showed no

independent or additive effect. However baseline nutritional status may not have been sufficiently compromised to benefit from a 10-week intervention (mean BMIs ranged between 24.5 and 25.8 kg/m<sup>2</sup> in the four study groups). Low muscle mass and muscle weakness were strongly related to impaired mobility, independent of the effects of chronic disease, dementia, depression and other characteristics of old age. Correction of muscle disuse was accompanied by enhanced activity levels and functional mobility. It was suggested that older people should participate in strength training in addition to aerobic exercise to maintain muscular strength and endurance.

Several US studies among healthy community-living elderly reported a relationship between BMI and functional impairment. Ensrud (1994) demonstrated among women that a combination of factors including obesity, medical conditions, physical inactivity and direct measures of neuromuscular performance were independent risk factors for reported difficulty in three or more ADLs. High BMI as well as other health conditions, poverty and base-line performance were also found to predict three year decline in physical performance (Seeman, 1994). Galanos et al (1994) provided strong evidence that both low and high BMI were still related to functional status after controlling for relevant variables concerning demography, cognition, depression, medical conditions and self-rated health.

Contrasting results were described by Lehman and Bassey (1996) who found no correlation between (change in) body weight and physical, psychological and social well being four years later in community living UK elderly. However average weight changes were very small and nearly as many gained as lost weight.

A relationship between nutrition and function has also been found in elderly people living in developing countries. In Malawi and India low BMI was independently related to poor handgrip strength and significant associations with (a history of) anaemia were found (Anklesaria, 1995; Chilima, 1998; Manandhar, 1999). Guatemalan elderly who rated themselves in good health tended to have BMIs in the normal range and could perform ADLs independently. Among those who rated themselves in poor health, a larger proportion reported having difficulties in ADLs and the majority of the females had high BMIs (Herman et al, 1998). Excess adipose tissue may reduce mobility and the ability to

perform self-care activities, or poorer function may be caused by metabolic changes due to obesity.

Nutrition indicators other than BMI and weight have also been related to function. A Yugoslavian study among institutionalised elderly demonstrated that low micronutrient blood parameters in the absence of clinical signs can still impair function. About 36% of the variability in cellular immunity was explained by sub-clinical micronutrient deficiencies. Vitamin supplementation improved immune function significantly. Handgrip strength also improved slightly in the whole group and significantly in those subjects with initial low grip strength (Suboticanec et al, 1989). Independently living Canadian elderly were supplemented with physiological amounts of micronutrients for one year. Compared to subjects who had received a placebo, a significant improvement in several indices of immunocompetence was observed in the supplemented group (Chandra, 1992).

Nutritional factors such as poor appetite, low albumin concentration, eating problems and eating alone showed independent associations with functional limitation among rural American elders (Jensen et al, 1997). Of Swedish elderly who were dependent in activities of daily life, a threefold higher proportion had low thiamine and protein intakes as compared to independent elderly (Steen et al, 1991). Generally home-living but recently hospitalised Norwegian elderly more often had reduced appetite and taste, dental problems and difficulties in shopping and cooking compared to home-living elderly. It was suggested that this may contribute to their worse nutritional and functional status and to the need for hospitalisation (Mowe & Bohmer, 1996).

A recent extensive literature review of longitudinal studies regarding risk factors for functional ability decline in community living older people, reported strong evidence for the following risk factors: low and high BMI, disease burden, lower extremity functional limitation, low level of physical activity, poor self-perceived health, depression, cognitive impairment, low frequency of social contacts, smoking, vision impairment and no alcohol use. It was noted that risk factors such as nutrition and environmental factors have been neglected in past research (Stuck et al, 1999).



### 3.5 Self-perceived health

Health status and healthy ageing are elements of function and hence determinants of quality of life in old age. Self-rated health is often incorporated in functional ability assessment as it is a useful general measure of health that both correlates with indicators of physical health and predicts mortality. There is a growing body of literature providing evidence that self-reported health may be a better predictor of health outcomes such as mortality and quality of life in older populations than several conventional objective health measures, even when controlling for age, sex, health conditions, medications and ADL performance (Kaplan et al, 1988) and this phenomenon is seen across cultures (Kaplan & Cachamo, 1983; Strawbridge et al, 1993; Shye et al, 1995).

Variation in self-perceived health between populations does not necessarily indicate variation in prevalence of disease. Jylhä et al (1998) compared self-rated health adjusted for age, education, disease and disability across two European cultures and gender. The results indicated that the *patterns* of evaluating health reflected different dimensions similarly. Nevertheless the authors noted that direct comparisons of the *level* of self-rated health should be made with caution, as there were marked differences. Older people rated their health better, which may indicate lower health expectations at advanced age. In other European populations patterns of disease and physical performance were also similar, whereas perceived health varied considerably indicating that coping with a given level of disease may depend on people's social and cultural role (SENECA Investigators, 1996b). Among Indonesian and Polynesian elderly, sight and hearing impairments, main channels of communication, translated into handicaps involving social activities in the community such as attending church, funerals and celebrations (Manton et al, 1986).

A cross-sectional study among Swedish elderly revealed that the most important factors related to perceived health were mobility problems, activity level and contentment with life (Lindgren et al, 1994). A study among rural aged Nigerians identified the degree of recently experienced stress (e.g. family problems, illness and death of children and friends) as the best predictor of both objective and subjective health status, indicating a relationship between anxiety and perceived health status (Togonu-Bickersteth, 1987).

Longitudinal studies also provide evidence of a relationship between self-reported health and physical and emotional function. An eight year follow-up study among Mexican-Americans and Anglos concluded that the less educated and those reporting lower levels of functional health were more likely to report declines in self-rated health and the former also reported increased psychological distress (Markides & Lee, 1989). In a UK cohort of people older than 75 years who were followed for seven years, poor perceived health was found to be predictive of greater functional decline even after adjustment for prior ADL-status, age and sex (Jagger et al, 1993).

In addition to age, sex and measured and self-perceived health, social factors including socio-demographic, socio-economic and psycho-social variables, have been related to overall functioning.

### **3.6 Social factors in relation to nutritional and functional status**

Relatively few studies have investigated the relationship between socio-economic status and function, despite the well-established relation with morbidity and mortality. Cross-sectional studies from the US and Canada have shown that even in old age, income is associated with function throughout the full gradient of income and remained significant after controlling for other socio-economic and socio-demographic variables (Forbes et al, 1991, Berkman & Gurland, 1998). Jensen et al (1997) identified amongst others low income and depression as significant predictors of functional limitation. In a Swedish dietary study the proportion with 'inadequate dietary habits' -as defined by the study-increased in groups of progressively lower social status, social participation and physical activity (Steen et al, 1991).

The independent role of socio-economic factors in function was also illustrated by longitudinal studies. A six year prospective American study identified predictors of successful ageing which was defined as needing no assistance in ADL, IADL, mobility and physical performance measures. After adjustment for age, sex, baseline successful ageing, education, income and a number of chronic conditions, the following predictors were identified: walking for exercise, no depression, close personal contacts and absence of certain health conditions (Strawbridge et al, 1996). Among elderly living in Tokyo and



in the US, social activities emerged as a strong predictor of function corrected for health related variables (Haga et al, 1991; Strawbridge et al, 1993). Maintaining or promoting the level of social activities may be helpful in maintaining competence in ADLs and IADLs and improving the quality of life.

Research even indicated that individuals, whose social network and support are weak, are at greater risk of death even when other important risk factors such as age, sex and health status are controlled for. Social networks function to meet basic emotional needs for social integration, reassurance of worth and intimacy, as well as practical needs for assistance, guidance and information. There is evidence that perceptions of whether support is available or adequate may be as important for well-being as actual levels of support (Grundy, 1996).

However men seem to benefit from a lower level of social support than women. This may be due to gender differences in patterns of social support and its psychological meaning and value. It has been suggested that given women's larger networks and greater emotional and practical involvement in them, the care giving aspect of their social role may result in costs to women's social network participation, in addition to possible benefits. Therefore women may only enjoy the protective effects of social support at relatively high support levels (Shye et al, 1995).

Penninx et al (1997) considered not only structural, functional and perceived aspects of social support, but also personal coping resources such as mastery and self-esteem among Dutch elderly. They found that rather than the number of social relations, fewer feelings of loneliness and greater feelings of mastery were associated with a reduced mortality risk (controlled for multiple confounders). On the other hand, receiving a low level of emotional support and a high level of instrumental support were associated with a higher risk of death.

Similarly Seeman et al (1996) found that a greater frequency of instrumental support was associated with a tendency of increased risk of ADL-disability independent of measured physical performance, and this was significant among men. Greater reliance on others may be indicative of the health-related need for such support. On the other hand it may

also, over time, result in loss of confidence and loss of actual ability, suggesting that instrumental support may have detrimental consequences for perceived independence, autonomy and general well-being of older people. It should be questioned whether this line of argument holds up in the context of other cultures. The greater cultural emphasis in developing countries on receipt of instrumental assistance at older ages may positively contribute to general well-being and give a feeling of independence from people outside the social network.

Strawbridge et al (1998) developed a new measure of frailty building on the concept of frailty as an individual's increased vulnerability to environmental challenge arising from problems and loss of capability. Frailty was defined as having two or more difficulties in the domains of physical, nutritive (loss of appetite, unexplained weight loss), cognitive and sensory (vision and hearing) functioning. Analyses were based on data from a large study among community-living older Americans that were collected each decade during a 30 year period. Frailty was assessed in survivors and was found to be strongly associated with fair or poor perceived health, physical inactivity and depression assessed during the previous three decades. Frail subjects were less likely to go out for entertainment or visits, had lower life satisfaction and poorer mental health.

Vailas et al (1998) provided evidence for the role of nutrition in elders' judgement of the quality of life, encompassing distinct domains of health such as functional ability, social, psychological and spiritual well-being and economic status. Decreased food enjoyment, chewing problems, unintentional weight loss and economic food insecurity were found to be significantly negatively associated with quality of life. The same was true for health related factors such as impaired functional status, poor health and depression. In contrast to the usual emphasis on nutrient composition of foods, the authors highlighted the important contribution of socio-psychological aspects of food to quality of life. Schlettwein-Gsell (1992) emphasised psychological aspects of food for the quality of life stating that with advancing age, increasing value is ascribed to the pleasure and enjoyment offered by food, the structuring effects of meals on social contacts and daily routine, and the impact of eating for self-esteem and situation awareness.

Self-rated health and social factors related to function have rarely been studied in developing countries. More culture-specific studies would contribute to a better understanding of this complex issue.

## **4. Nutritional vulnerability**

Taking into account the interactions between nutritional status and social, environmental and medical conditions, attention is paid in this chapter to an earlier preventive approach through the recognition of the risk factors that may lead to undernutrition. Identification of risk factors specific to elderly people in unstable situations would make it possible to target those who may be especially prone to undernutrition and those who are already undernourished.

In this section, operational terms will first be clarified and illustrated with examples. Then evidence of vulnerability of older people will be given and various components of nutritional vulnerability will be discussed.

### **4.1 The concept of vulnerability**

Vulnerability is a frequently used concept that appears in many different contexts. It was first used in the field of natural hazards. Epidemiologists have considered vulnerability to diseases, and in the field of nutrition it has been used in relation to famine and food insecurity. Vulnerability may refer to regions, populations, households as well as to individuals. In the context of unstable situations, Longhurst (1994) summarised that vulnerability has been defined in terms of capacity, resilience and sensitivity, coping and adaptation. He concluded that "the key element is that, during an emergency, affected people have crossed a threshold where their behaviour becomes different...". Using the example of access to food, the different terms seem to agree insofar that there is a trigger event that forces people to change their ways of food acquisition, which has various impacts and outcomes.

Anderson & Woodrow (1991) examined a large number of drought and famine relief projects and linked vulnerability to capacities of the affected population. They argued that disaster 'victims' have capacities that are not necessarily destroyed in a disaster and therefore relief programmes should build upon these capacities. They distinguish between physical/material vulnerability (productive resources), social/organisational vulnerability (relations and organisation among people), and motivational/attitudinal vulnerability (how a community views its ability to change).

According to Davis (1996) individuals and groups within a population have different degrees and types of vulnerability. Depending on susceptibility and exposure to risk, various groups will suffer differently. Considering emergency settings, vulnerability may relate to the physical realm: certain groups may be more susceptible than others to for example micronutrient deficiencies. It may also relate to the economic domain: the ability to work and generate food or income, or even how groups are differentially serviced by aid programmes (e.g. adults receive food from the general distribution whereas children may also receive supplementary food). Further there are social factors and the amount of influences an individual or group has: social and political status (who you are) may be more important than wealth status (what you have), and lastly the psychological sphere, namely the degree of trauma suffered.

Branca (1998) stated that vulnerability is very common in refugee settings where subsistence depends on outside sources and efforts to become self-reliant are undermined by the lack of a future perspective. He described vulnerability as "a combination of being physically weaker, economically impoverished, socially dependent, psychologically harmed". Vulnerability was analysed at the individual level (physical/biological characteristics) and household level (social and economic characteristics).

Vulnerability in fact considers *the interaction between exposure to risk and the ability to cope or adapt*. Following Davies' (1993) distinction between coping and adaptation, adaptation is more appropriate to use in the context of war refugees since coping refers to a short-term response to an immediate and unusual decline in access to food, whereas adaptation implies a permanent change. Since war refugees migrate for an indefinite period of time and root causes of complex emergencies cannot be expected to be resolved instantly, the changed situation will often last several years. The consequence of distress migration is that people cannot use the coping strategies they normally use during, for instance, periods of food shortage. They have lost their country, home, land or occupation and have to adapt by finding ways to survive in a new, unknown and uncertain situation.

Vulnerability has external and internal aspects: external is the exposure to shocks and internal is people's ability to adapt. As pointed out, vulnerability is determined by physical, economic, social and psychological factors. In this study, nutritional vulnerability refers to the susceptibility to undernutrition and can be defined as *the interaction between exposure to*

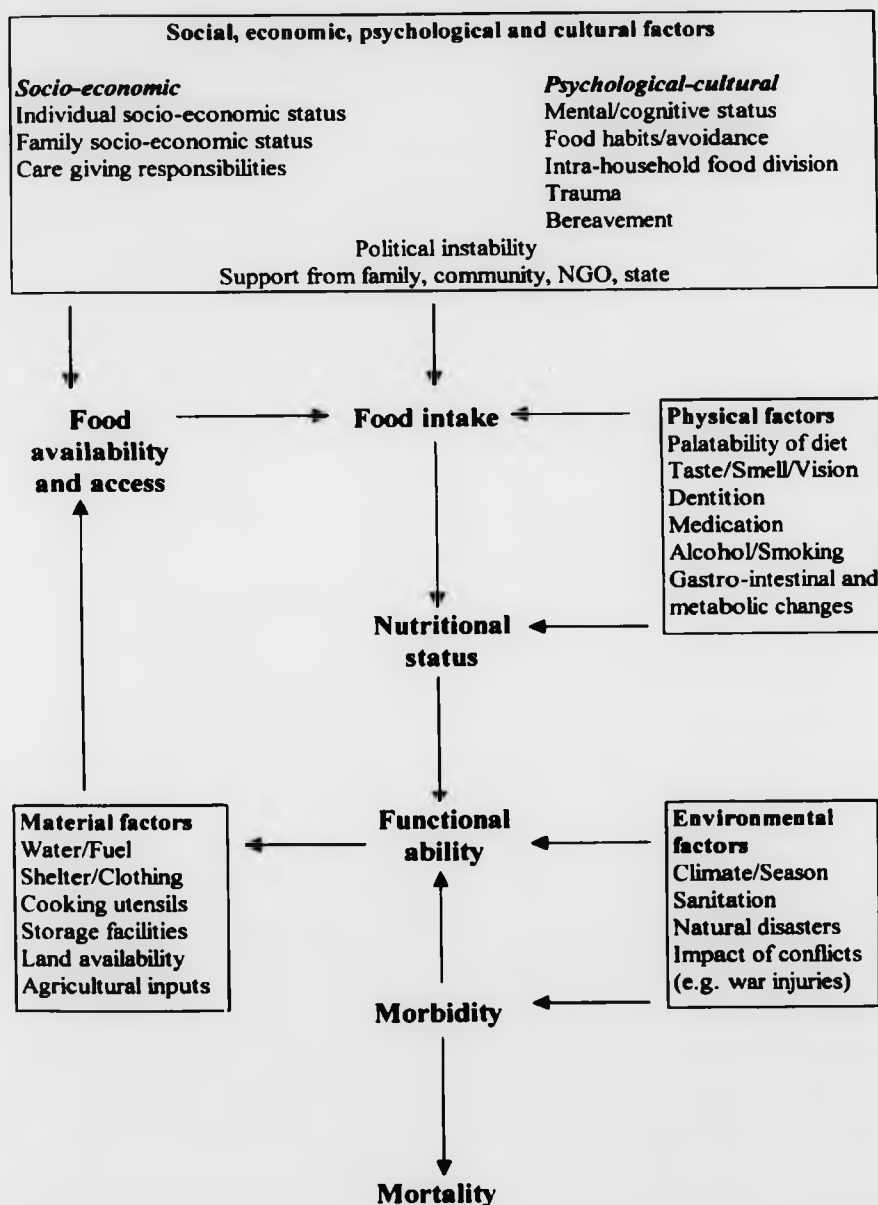
*external shock or risks and the physical, economic, social and psychological ability to adapt and acquire food and maintain good health.*

## **4.2 Nutritional risk factors**

Identification of risk factors for malnutrition in the elderly is not new. However it has mainly been applied in industrialised countries considering under- as well as overnutrition. In the context of developing countries undernutrition has been the focus, which is directly related to inadequate food intake. Risk factors for low food intake can roughly be divided into factors that directly affect what is eaten and factors that affect availability of and access to food. The model displayed in figure 4.1 visualises how nutritional status, functional ability, morbidity and mortality are inter-related.

Nutritional status and functional ability are the central concepts in the model, the former influencing the latter in various ways. Functional ability affects food availability through availability and utilisation of material assets. For instance when working ability is reduced, resources such as land, cooking utensils or firewood cannot be optimally utilised for food production. In case of poverty these resources may even be lacking, therewith reducing food availability. Functional ability and morbidity are inter-related. Both are influenced by environmental factors such as sanitation, seasonal conditions, but also war injuries leading to disability and illness. Morbidity is the most obvious factor controlling mortality, but there is certainly interaction with other factors such as nutritional status, sanitation, health care and family care.

Figure 4.1 Inter-relations of nutritional status, functional ability, morbidity and mortality (inspired by Kohrs et al, 1989)



Obviously there is a relation between food availability and nutritional status via food intake. However, availability of food does not safeguard adequate intake. Factors of a social, economic, cultural and psychological nature may prevent as well as stimulate food intake. These may act upon the group level or individual level. Societies that are divided are more vulnerable than cohesive societies where people take care of each other. Also the situation of social institutions on the micro-level such as the household, family and local community will determine the vulnerability of its individual members, since people with no access to adequate support structures are more vulnerable. In addition the social network, social and political power structures and decision making power may play a role. One of the reasons why women are often more vulnerable than men is their exclusion from decision making, their limited access to resources and reduced mobility due to social restrictions. Support networks can directly influence an individual's access to food. Essential aspects are the socio-economic status of the family as well as the individual, the ratio of productive to unproductive members, intra-household food division, support (food, financial, social) from kin, the local community, NGOs or the state. Psycho-social factors have been identified as being of high importance in limiting older people's food intake (Heikkinen, 1983; Bowman & Rosenberg, 1982; Coe & Miller, 1984; Clarke et al, 1998).

Further, food intake also depends on physical factors. These include 'internal' factors such as dentition, vision, taste, smell and gastro-intestinal and metabolic changes, but also 'external' factors such as the impact on appetite of medication, alcohol, smoking or palatability of the diet. Physiological functions may also directly influence nutritional status, for instance malabsorption due to disease.

The risk factors specified in the model are certainly not exhaustive and only the most relevant relations are indicated. It should be noted that, although this model refers to the situation of elderly people in unstable situations in developing countries, it is still fairly general and should be refined for each specific situation. It must also be emphasised that each risk factor is only a potential danger sign and therefore should be considered in relation to the others. Thus, although disability or depression may not in itself affect nutritional status, its danger must be recognised when it is, for instance, found in combination with absence of caregivers (Davies, 1990; 1991).



### **4.3 Nutritional vulnerability in unstable situations**

An emergency situation particularly in the case of armed conflicts, increases exposure to risk and restricts coping abilities. It has even been stated that war creates famine by the destruction of battle, the diversion of resources to armies and by deliberate siege tactics and counterinsurgency strategies (de Waal, 1993). In the unpredictable and often violent setting of mass population migration, exposure to risk is not limited to any one group (Toole, 1996). However some manage better than others in adapting to the new situation. Although there is limited literature available about older adults and elderly people in unstable situations, elderly refugees have been recognised as a potentially vulnerable group (Pankhurst, 1984; Oliver, 1997) as illustrated in the following sections.

#### ***Morbidity and mortality***

Most emergency situations are characterised by a high prevalence of undernutrition, morbidity and mortality (Burkholder & Toole, 1995). The major diseases (undernutrition, diarrhoeal diseases, measles, malaria, acute respiratory infections) are normally seen in stable populations. However the excess mortality seen in emergencies is strongly influenced by the interaction between infectious disease and undernutrition, as suggested by epidemiological data (Toole & Waldman, 1990; CDC, 1992; Young & Jaspars, 1995). Thus mortality from undernutrition depends on exposure to disease, although lack of food on its own also causes death. Mortality rates are the most specific indicators of the health status of refugee populations. Although age-segregated mortality rates beyond children under five years are scarce, high mortality rates in the very young and very old, particularly during the flight and immediately thereafter, have been reported (Godfrey, 1985; Toole, 1995; Toole & Waldman, 1997).

Davis (1996) compared mortality rates of young children with that of older children and adults under normal conditions and in African emergency settings, including Rwandan camps in Tanzania and Zaire. Mortality rates among under fives were found to be higher than those of over fives in both situations. However the relative risk for under fives versus over fives mortality under emergency conditions was smaller than under normal circumstances. Thus children over five and adults were disproportionately affected by exposure to emergency risk than younger children. In a Rwandan camp in Zaire, highest mortality rates were even found among people aged 45 years and over. Besides different levels of mortality, different mortality

patterns have also been reported from Sudan, Angola and Somalia. Initially under fives mortality was very high but declined rapidly, whereas the crude mortality rate (that includes the whole population) remained high for long periods of time.

Severe malnutrition and death in adults may occur later than the peak in child mortality as adults are more resilient and their energy requirements are proportionally less than those in children. Thus in later phases of emergencies, starving adults can be expected to constitute a large proportion of the nutritional problem (pers. com. Collins, 1995). Severe adult malnutrition occurred in Somalia at a time when reasonable quantities of food were available (Collins, 1993).

The nutritional situation of the elderly has even been suggested to serve as a warning signal for problems in the population at large in unstable situations (WHO, 1995). In displaced populations, the elderly are the first to show oedema associated with protein deficiency and have the highest adult mortality (Horwitz et al, 1989). Little work has been done in this area and the need for a research base to fill the knowledge gap on elderly undernutrition in emergencies has been called for (Shoham, 1995). Access to food is one of the major problems in unstable situations and relatively dependent people can be expected to have most difficulties in obtaining food. Recently the nutritional vulnerability of elderly people trapped in besieged cities in war troubled former Yugoslavia has clearly been demonstrated. Initial nutrition surveys focused on children showed little or no undernutrition. However, subsequent surveys focused on the elderly consistently showed 11-21 % of the elderly to have a BMI < 18.5 kg/m<sup>2</sup> (Vespa & Watson, 1995; Watson et al, 1995; Watson & Vespa, 1995). Most vulnerable were those elderly who lived alone or in collective centres, who were highly dependent on food aid, had no relatives to support them and had fewer possessions to sell (Watson et al, 1995).

The elderly in Bosnia-Herzegovina suffered more than twice as much from illness compared to the rest of the population. Besides a lack of food, increased energy needs, reduced appetite, reduced utility of food by the body due to illness, cold and stress all played a role in determining the elderly's nutritional status. It was stated that this group must be recognised as especially vulnerable to the effects of cold because of their

reduced cold sensitivity, reduced fat stores, lower resting metabolic rate and impaired ability to exercise (Watson & Vespa, 1995).

### ***Weight and BMI***

In war-affected Armenia, specific attention was paid to the nutritional status of pensioners. This group was at nutritional risk, as many pensioners could not get enough food because of insufficient money, poor availability of food and long food lines. A weight loss of more than 5 kg in the previous year was reported by 45%. Pensioners with illnesses affecting eating and those who had not received aid were at especially high risk for nutritional disease (McNabb et al, 1994).

Some calculations of BMI have been done among displaced elderly Mozambicans living in Mozambique and Zimbabwe (Ramji & Thoner, 1991). A high percentage was categorised as underweight based on the BMI cut-off of 20 kg/m<sup>2</sup>. In Mozambique the percentages were 51% and 80% for men and women and in Zimbabwe 48% and 33% respectively.

Godfrey (1985) also included weight and height measurements in a survey among older refugees (over 45 years) in Sudan. Percentages of men and women with BMI < 20 kg/m<sup>2</sup> were 70% and 54% respectively. The author mentioned that there is evidence to assume that the results were not representative and may only have included the better nourished. Thus the true figures may even be higher. Comparison with similar stable populations showed that the proportion of older adults was less than half among the refugees.

### ***Micronutrients***

Micronutrient deficiencies also play a crucial role in nutritional status and functional impairment and can be fatal. Among older rural Malays estimated intakes of energy and nutrients such as vitamin A, thiamin, riboflavin, niacin, iron and calcium were only 55-90% of the Malaysian RDA, although these people were apparently healthy (Shahar et al, 1998).

Little evidence of micronutrient deficiency was found among adults in Bosnia-Herzegovina. However serum concentrations of some micronutrients were low and given

the fact that prevailing food rations failed to maintain adequate reserves, deficiencies were likely to develop if conditions had worsened (Mardel et al, 1995).

Micronutrient deficiencies among refugees have frequently been reported, particularly in cases of high dependence on inadequate relief food (Berry-Koch et al, 1990; Nieburg et al, 1992; Queinnec & Rigal, 1995). Pellagra outbreaks among adult Mozambican refugees (Moren, 1990), beri-beri among adult refugees in Thailand and anaemia have been documented (Berry-Koch et al, 1990). Even in a stable situation in South Africa, anaemia was found in 13.9% of coloured low income people aged over 65 years, which was higher than that reported in European elderly (Charlton et al, 1997). Age-specific data are scarce. High prevalences of scurvy that increased with age were reported among several Ethiopian refugee communities, living on a ration deficient in vitamin C with insufficient fresh food available for purchase. Those aged over 45 years and women particularly of childbearing age, exhibited the highest prevalence (Desenclos et al, 1989).

Failure to respond to supplementary food has been reason to 'classify' underweight older refugees as 'social' or 'medical' cases who cannot be helped with nutrition intervention. However folate deficiencies (caused by lack of fruits and vegetables) and neurological diseases are believed to be the major reason for non-response on feeding in older people (pers. com. Golden). If addressing medical conditions along with nutrition intervention is common practice in children, it is unclear why it is not widely accepted for older adults in emergency situations.

#### **4.4 Components of nutritional vulnerability**

In the following section, components of nutritional vulnerability will be discussed, mostly in the context of elderly refugees.

##### **4.4.1 Physical factors**

Even under normal conditions, the elderly are more susceptible to micronutrient deficiencies due to a general diminution in nutrient intake, resulting from a reduced energy intake. Loss of teeth, taste and smell acuity, problems with swallowing or other functional impairment may further lead to reduced food intake. In a refugee setting where people rely almost entirely on cereals, beans and oil, nutrient deficiencies will eventually occur. The highest prevalence of

such deficiencies have been within the traditionally vulnerable groups: children, pregnant and lactating women and the elderly (Berry-Koch, 1990).

A decline in immunity makes the elderly more prone to infections and diseases which might increase nutritional requirements and impair appetite. Moreover, the elderly have more difficulties in coping with cold due to a reduced metabolic rate and the loss of subcutaneous fat (Winick, 1976; Horwitz et al, 1989; Munro & Danford, 1989). In unstable situations, the physical hardship is felt more harshly by the elderly and sets the conditions for developing psycho-social difficulties as was seen in former Yugoslavia (see 4.3 and 4.4.4).

#### **4.4.2 Economic factors**

The nature of food rations provided in Africa (cereal, pulses and a fat source, often in erratic supplies), obliges the recipients to seek other food supplies to enhance the diet. They undertake economic initiatives to earn money or make material progress (informal wage labour, petty trade and crafts, production or exchange of consumption goods, gathering wild foods). Elderly people are likely to be less able to engage in such activities and thus more confined to the nutritionally inadequate food rations (Wilson, 1992; pers. com. Cook, 1995).

African refugees also face the problem that food rations tend to be the main aid disbursement with which to meet non-food needs as well (shelter, clothing, soap, transportation etc.). The materially vulnerable are usually obliged to dispose of much of their ration to meet other requirements. This is also true for older refugees who have fewer opportunities to engage in economic activities to satisfy their non-food needs. Isolated elderly people in a Mozambican refugee camp were selling much of their precarious food supply to pay for the grinding of cereals and to purchase extremely scarce firewood (Wilson, 1992). Rwandan refugees in Tanzania sold the distributed whole grain maize to buy their usual staple food (plantain, sweet potatoes, cassava). However, this was at the expense of the energy content of their diets since market prices of the preferred food were high. It was estimated that the energy reduction factor ranged from 4.3 to 8.8<sup>1</sup> in Ngara district at the end of 1994 (Hoogendoorn, 1994). A recent study among Burundian and Rwandan refugees in Zaire concluded that food sales generally improved the micronutrient content, but resulted in a reduced energy value. The poorest households were twice as likely to sell or exchange food and their diets were worst.

<sup>1</sup> Thus the monetary value of 880-430 kcal maize and 100 kcal plantain were equivalent.

Reasons why refugees were provoked to sell part of the ration were that important components of the food basket were missing (salt) or caused difficulties in food preparation, and the need to diversify the diet and to cover non-food needs (Reed & Habicht, 1998).

Until recently, the sale of food aid by refugees was a controversial topic, as it was argued to be a sign of over-distribution. It has now been accepted by WFP and UNHCR that refugees need to sell part of the general ration to meet other basic needs not catered for by the various programmes of assistance (Jaspars, 1995).

#### **4.4.3 Social factors**

Support structures are essential for elderly people given that they are generally more dependant. Loss of family, friends, professional and community support in emergencies may therefore have a significant impact on the elderly. This section highlights some support structures for elderly people.

The role of the family for the well-being of the elderly is universally acknowledged. However this must not be idealised as there is evidence that the presence of the family, even under normal circumstances, does not guarantee that the elderly are always properly looked after (Rwezaura, 1989; Apt, 1990, 1993; Ingstad & Bruun, 1994). A major common feature of the extended family is the collective responsibility for all household members. Also in Rwanda families and friends play a major role in support and care for the elderly (Thomas & Atkinson, 1995). Traditionally, elderly people live in extended families structured by patrilineal descent. They have their own living quarters in the family's compound and look after themselves for as long as possible. Sometimes grandchildren live with them and assist with the daily work. When they are no longer able to provide for themselves, the elderly are taken care of by the son's family (Marzi, 1994).

Urban migration has been observed to have drastic consequences on the support to rural elderly. The ability of modern families in developing countries to care for elderly relatives in an urban environment is seriously impaired by limited financial resources, crowded housing and increased employment of women (Apt, 1990). Moreover, age-selective migration to urban areas may imply the loss of a major source of economic and social support for rural elderly (Okojie, 1988; Sen et al, 1993).

Also in Rwanda, the practice of reciprocal support had already been eroded before the war broke out as a result of disintegration of traditional family structures due to economic and demographic problems. Increasing materialistic dependency on children has weakened the authority and status of elderly people in the Rwandan society (Marzi, 1994). A deteriorating social status of the elderly has also been signalled in other African countries (Rwezaura, 1989; Bruun, 1994).

Although the traditional family structure is changing, extended families continue to be the primary support system for African elderly and emotional ties and economic support among family members still remain strong. Those without children are especially vulnerable to the problems of acquisition of basic needs and decreasing functional ability. This is likely to present more difficulties for women than for men, since most older women are widowed and thus more dependent on children (Apt, 1990; Cattell, 1990).

If the needs for social support outlined above are of concern to elderly people in normal situations, then it follows that the same needs will constitute an even greater burden to the elderly in refugee circumstances. The degree of social support that elderly people receive in unstable situations partly depends upon the nature of social structures in the normal situation and the extent to which they have been disrupted. If social cohesion had never been strong, or if many families have split, caring behaviour is likely to be reduced. An extensive anthropological study of Ugandan refugees in Sudan provided evidence of eroded social behaviour, in particular in respect of reciprocal family obligations which were observed prior to exodus (Harrell-Bond, 1986). In contrast, a survey among Ethiopian refugees in Sudan revealed that most older adults lived with and were cared for by family and friends. Only 6% of them reported an unmet need for assistance on a regular basis (Godfrey & Kalache, 1989).

Although sickness, loss of property and death limit the flexibility of the family structure in providing support, this is not the only explanation for greater lack of support to elderly seen in unstable situations. Social upheaval can change the position of people in society and elderly people are vulnerable in this respect. For instance the loss of property in an emergency setting is likely to cause the elderly a loss of status. While traditionally the elders had control over strategic as well as scarce resources such as land, livestock, essential skills and ritual powers, the majority of refugees have lost such resources. This has resulted in the elderly losing not

only their dominant position, but their social status and prestige as well (Mupedziswa, 1989). Most elderly people have been stripped of the status associated with old age and most refugee communities have not, for the most part, opted to re-instate traditional figures of authority. Instead their positions have been taken over by NGO staff and the young. Cross-cultural findings from various Asian countries suggest that involving older people in family decision-making and greater social integration can, in part, mitigate psychological distress among the elderly, resulting from financial strain (Ferraro & Su, 1999).

A participatory appraisal among elderly people in 'post-war' Rwanda revealed that despite the eroded traditional status of the elders, the family still offered the main social support structure. Besides this, elderly people received some assistance from the community (neighbours and other relatives). Family support depended upon the following factors:

1. The presence of family members.
2. The relative wealth of the family and community.
3. The proportion older adults to younger people.
4. Relations within the family and community (Thomas & Atkinson, 1995).

Besides the family, other forms of support have been reported from refugee situations in African and Asian countries. Elderly people formed mutual support groups to care for each other and to repatriate together. Churches also play a role in supporting the elderly. Remarkable are reported alliances between lone older persons and unaccompanied children (pers. com. Cook, 1995). This may be entirely altruistic or deliberately developed strategic-social relations to secure care and food.

Relief agencies are another potential source of support for elderly. Unfortunately these organisations are not always aware of their needs, and the elderly as a group might be less able to put themselves forward for assistance. Moreover, elderly people may need assistance to use the offered services such as visiting clinics.

The well-known relationship between social status and health has also been noted in refugee communities as social or political status can directly influence access to food (Davis, 1996). Low self esteem can also play a role however, as some elderly tend to put themselves last (Strachan, 1986).



Despite the fact that even physically impaired older people are in many cases still quite productive (child care, light household tasks, advice), they are often seen as being a (economic) burden for the family (Pankhurst, 1984; Squire, 1991). This can even result in "scape-goating" and children stealing from parents (pers. com. Cook, 1995). Also Keen (1992) mentioned the tendency to a shrinking of generosity, an increase of theft and in some cases abandonment of the old and the very young in severe famine.

#### **4.4.4 Psychological factors**

Mental health of refugees is an issue receiving more attention recently. Especially when war and conflicts were the main reasons to flee, the majority will have experienced traumatic events such as murder, torture, rape, threat, humiliation or injury, either as a victim, as a witness or some may have participated in cruelties or have been forced to do so. Sexual violence and abuse are a frequent experience for refugee women before or during the flight or in refugee camps, and have even become a routine element of persecution of women (Kalipeni & Oppong, 1998).

In addition to traumatic experiences directly related to the emergency, the situation in refugee camps also leads to frustration and passiveness that may result in mental problems. Refugees in camps are told where to live, what to eat and what they can and cannot do. They become disempowered and depend on others. This is likely to affect their self-esteem and dignity, and promote unhealthy social conditions (Needham, 1994). Moreover older refugees have to live with the stressful perspective of dying in exile and often have given up hope of returning to their country.

During the crisis in Bosnia-Herzegovina it was observed that a high percentage of the population suffered from mental health problems. Particularly elderly people who had been left behind by family members did not cope alone in a highly stressful situation (Watson & Vespa, 1995). A study among female Mozambican refugees showed that both trauma and stress were lessened by family and community support (McCallin, 1991).

Englund (1998) stated that past experiences are only partly responsible for mental problems among refugees. The inability to properly bury and mourn their dead seems to be equally affecting. It was stated that creating conditions to enable refugees to perform death rituals

may be more mentally healing than verbal treatment of trauma by western-trained psychologists. The author suggested that food aid contain provisions for funeral guests, supply of burial material (wood, cloth), and that aid organisations facilitate travels to funerals in other settlements and announce death to relatives at distance.

Mental stress can lead to changes in eating patterns that may adversely affect nutritional status. Psychological problems are often expressed by complaints about physical living conditions such as food, water, shelter and health (Needham, 1994; pers. com. Bergman, 1995). In the context of refugees who mainly depend on food aid, 'psychological malnourishment' may be a serious issue. Food habits influence the perception of malnutrition as illustrated in former Yugoslavia. Although people were not underweight, many felt malnourished because they no longer consumed red meat and coffee, items they used to have daily. Problems related to cultural aversion to food aid have been reported in several studies (Strachan, 1986; Squire, 1991; Wilson, 1992; Reed & Habicht, 1998).

#### **4.5 Gender differences in vulnerability**

Compared to men, the situation of older women seems to be particularly precarious, primarily as a consequence of widowhood and socio-economic dependency on their families (Apt, 1990; UN, 1994; Sen, 1994). Women who are widowed, divorced or left behind will invariably remain alone, while an elderly man in the same situation tends to find a younger wife who ensures his provision. In relation to the earlier mentioned "scape-goating", especially elder women were blamed and expelled (pers. com. Cook, 1995). Despite the lack of sex-specific data, a number of authors reported higher morbidity and mortality rates among women in refugee and displaced populations (Toole & Waldman, 1997). Among Burmese refugees older than five years, the female death rate was 3.5 times that for males (CDC, 1992).

Women are mostly primary care givers (UN, 1993) but the situation might be different when it comes to receiving care. In a survey among urban community-living elderly in Guyana, more women than men responded that they had no one to help them with daily activities. Among the widowed and divorced, a higher proportion of women had no help. There was also a tendency for women to report that they received most help from a non-spouse even while they lived with a spouse (PAHO, 1989).

Community perceptions on poverty were investigated in rural Kenya using household surveys, participatory rapid appraisal techniques and focus group discussions. Ageing emerged as an overruling biological condition that was associated with a number of factors that were directly responsible for poverty such as widowhood, disability, reduced capacity to generate resources. Other factors were childlessness and not having a helper. Although resources were accessible to both sexes, control and benefit were within the man's domain, indicating gender implications for poverty that continue into old age (Oranga, 1997).

Women and men might even perceive and define vulnerability differently. A participatory exercise on perceptions of well being among elderly Mozambican refugees revealed that men's definition of well being centred around economic assets and property, while women defined the concept more in social terms and emphasised the presence of family members (Heslop, 1995).

More specific to nutrition, discrimination of girls and women has been suggested by Rivers (1982) and Wheeler (1984). However gender differences do not always work out negatively as was noticed in a study among the elderly in Botswana. Women were better off than men in terms of nutrition since women looked after grandchildren and thus could eat the same food (Ingstad & Bruun, 1994).

#### **4.6 Nutritional vulnerability assessment**

Attempts have been made to assess nutritional vulnerability in individuals and groups in order to identify those who need to be monitored and on whom interventions should be focused. Most methods are based on a questionnaire and designed for use in western countries. The main limitation is that questionnaires need to be adapted to the local context, but most authors seem to agree that nutritional vulnerability screening should be multidimensional. One of the preconditions for any screening to be appropriate is that it leads to effective intervention. Although diet is only one contributor to nutritional status, dietary intervention has been proven to have great potential benefits (Rush, 1997).

Exton-Smith distinguished between primary and secondary causes of malnutrition. Examples of the first category are ignorance, social isolation, physical or mental disability and poverty.

whereas impaired appetite, mastication problems, and malabsorption were categorised as secondary causes of malnutrition (In: Davies, 1984). The UK Department of Health and Social Security mentioned very similar factors that were categorised as medical and social risk factors. Davies (1984, 1990, 1991) distinguished between risk factors and warning signals based on UK studies. Warning signals are observable circumstances that, if left unchecked, might directly cause an at-risk individual to become undernourished. It was noted that risks and warning signals are likely to be interrelated and cumulative, and that the likelihood of undernutrition increases with a multiplicity of risks and warning signals.

The Nutritional Risk Index was developed in the US for use with older people. The list contains items covering health, weight change, appetite and smoking. It correlated significantly with established clinical and laboratory markers of poor nutritional status and was tested to be valid and reliable (Wolinsky et al, 1990).

The Nutritional Risk Assessment Scale was developed in Germany. It covers medical, social, cognitive, emotional, life style and mobility items relating to nutrition. Scores on this scale correlated significantly with the physician's judgement, anthropometric and biochemical assessment and was found to be reliable, valid and easily completed (Nikolaus et al, 1995).

The Determine Your Nutritional Health Checklist (developed as part of the Nutrition Screening Initiative) includes ten yes/no items that are given different weights associated with the nutritional well-being of older people. Another tool that was developed in France is the Mini Nutritional Assessment, comprising both items to be measured and asked. De Groot et al (1998) compared the two screening tools with similar information of a European cohort from the SENECA study. The two risk appraisal questionnaires were of limited value in this population as they classified the SENECA participants differently and had low specificity. Rather than identifying the undernourished, they seemed to identify those at risk of poor nutrient intake. Nevertheless timely signalling of impending poor nutritional status may be equally important.

HelpAge International developed and used a "Vulnerable Individual Checklist" during the height of the Rwandan refugee crisis in Karagwe, Tanzania. It aimed to

systematically identify those individuals who could not cope with their basic needs and had nobody to turn to. The list assessed living arrangement, available assistance with water and fuel collection and food preparation, health problems, mobility and basic material needs. As soon as the situation allowed, a community support structure was established so as to avoid unsustainable dependency on NGOs (O'Donoghue & Heslop, 1997).

Aid organisations undoubtedly will have their own working criteria to identify the most vulnerable. It would be helpful if such information and experiences became available to the public. It would also provide a base for more work in this area in developing countries.

#### **4.7 Addressing vulnerability**

The elderly must not be seen as dependent receivers and a burden on their environment. Many of them are still active in old age and contribute to agriculture, household activities, child care, play a role as adviser and pass skills and culture. Wherever possible, they will develop mechanisms aimed at maintaining access to food and resources and minimising exposure to risk. Apart from obvious measures to reduce nutritional vulnerability such as ensuring adequate food supply and (medical) services, the challenge is to meet immediate needs in such a way that capacities are promoted and vulnerability reduced (Anderson & Woodrow, 1991) such as sustaining productivity of the aged and encouraging family support rather than collective care (Solomons, 1992).

An example of an alternative response is the community development approach adopted by UNHCR and aid agencies in Rwandan refugee camps in Ngara district, Tanzania. This was based on facilitating sub-communities to identify their problems and needs, and subsequently provide funds to access resources to meet the identified needs. As whole communities had fled together, there was some representation of community groupings. Although these were not participatory in nature, it provided at least some stability. This resulted in group micro-loans to single parents for petty trading, vocational business training through apprenticeship in existing businesses, community participation in the construction of school buildings and setting up a network of refugee social workers to meet the needs of unaccompanied children and their foster parents (Reynolds, 1995). There were also activities geared to older people

such as training in business and home-based care to stimulate the community to care for elderly but at the same time encouraging the elderly to care for others where possible (pers. com. HAI Ngara).

Such an approach takes account of older people's (and others) potentials and may increase their autonomy, provide opportunities to remain in control of their lives, and to participate in the community, which conforms to the UN Principles for Older Persons (1991).

***The HelpAge International intervention in Karagwe district***

HAI's aim was to ensure that elderly got equal access to camp services such as food (general ration and supplementary food if necessary), health care and non-food items. HAI worked through lobbying and advocacy to other NGOs and supported (through other NGOs or independently) for those elderly who still did not have equal access.

HAI held extra non-food distributions to make sure all elderly people at least had a plastic roofing sheet and utensils, and at times extra goods like soap or clothes were distributed. In the HAI compound there were facilities for social and occupational activities (mat, basket and sandal making, sewing, black smith, pottery) for which materials were provided. A plot of land in the camp allocated to HAI served as communal garden for older people. Inputs were provided and the produce was divided among 'extremely vulnerable elderly' and those who had provided labour. HAI organised literacy classes for older people (in Kinyarwanda and Kiswahili) and occasionally also eye clinics and other events.

HAI worked through a network of home visitors (usually belonging to the target group) and leaders of the elderly community. The most vulnerable individuals were regularly visited and assisted if necessary, and the local community was encouraged to do so. Home visitors also delivered supplementary rations given out by Memisa and checked on social aspects. A nurse and physiotherapist with a rehabilitation team working for HAI treated older patients. The target group also assisted HAI for instance by providing labour.

**MSF**

Nowadays MSF includes children up to 10 years of age in feeding programmes. If occasionally an adult presents him/herself (often referred by the clinics), the person is admitted on clinical grounds. In case adult malnutrition is a larger problem, MSF sets up separate adult feeding wards. Entry criteria are based on BMI 16 kg/m<sup>2</sup>, but increasingly on MUAC 18.5 cm (no justification of this cut-off is provided) and a general clinical assessment of weakness (of which inability to stand is the most extreme). The gradual shift to MUAC instead of BMI is based on the fact that BMI is very much population specific, and on preliminary data that suggest that MUAC and mortality risk are fairly consistent between populations. Nevertheless MSF still relies heavily on clinical judgements although these are hard to standardise, and expects this will remain so regardless of developments in anthropometry. Monitoring older patients in feeding centres consists of regularly checking weight and clinical status.

Elderly patients receive the same treatment as adults in terms of diets, entry and discharge criteria. Since some older people never meet the discharge criteria because of their constitution, a four to six week time limit is added to their stay in a therapeutic feeding centre. If a thorough medical screening shows that they are sufficiently healthy and strong to be discharged, they are referred to a supplementary feeding or social programme. MSF does not include social factors in their screening although this is regarded to be important. MSF usually operates in acute emergency situations when there is no time to consider issues other than morbidity and mortality. Considering social aspects and running social programmes is left to other agencies.

It must be realised that adult patients cannot be controlled to the same extent as children. If they feel hungry, they will not comply with recommended feeding regimes, even though non-compliance may be life-threatening. Moreover adults do not easily observe discharge criteria: some will leave the feeding centre as soon as they feel well enough to meet their obligations at home, while others refuse to leave (for security or other reasons) despite meeting the discharge criteria (pers. com. MSF-Holland, 1999).

***Oxfam***

In an emergency situation, Oxfam generally considers the elderly as a group that is likely to be vulnerable. This generic list also includes the disabled, female headed households and children under five years of age, whose nutritional status is used as a proxy for the condition of the population at large.

Oxfam currently does not have a systematic approach to assessing vulnerability in the elderly. Anthropometric data are not used, morbidity and mortality data are usually disaggregated as under and over five years of age, and socio-economic data are generally presented at the household and not at the individual level. Clinical signs of pitting oedema have been used to include elderly in feeding programmes, but with time criteria for discharge to avoid long-term inclusion of oedema cases due to medical conditions. However some offices use community based information for identification of vulnerable people. An example comes from development programmes in flood prone areas in Bangladesh where a list with vulnerable individuals was developed with the community prior to a crisis.

Oxfam handles no standard criteria for anthropometry, clinical signs or social aspects. It is believed that a screening tool for nutrition programmes should be based on social rather than anthropometric criteria since kyphosis poses problems to the use of anthropometry and vulnerability in the elderly often has a social origin (pers. com. Oxfam-UK, 1999).



## 5. Study design and methodology

The study involved the collection of quantitative and qualitative information regarding older refugees. Quantitative information consisted of:

1. Anthropometric measurements.
2. Functional ability assessment by means of a questionnaire regarding independence in activities of daily living (ADL) and performance in simple physical tests.
3. Clinical screening by observation and questionnaire.
4. Socio-economic and dietary issues by questionnaire.

Qualitative information was obtained through in-depth and group interviews with elderly people, interviews with key informants and observations.

### *Hypothesis and objectives*

The purpose of this study was to examine the determinants of nutritional vulnerability among older adults and elderly people in refugee camps. It aimed to test the following hypothesis:

The nutritional status of older adults and elderly people in refugee camps is determined by functional ability, socio-economic conditions, health status and access to food.

The objectives of the study were:

1. To describe the anthropometric status and functional ability of older refugees.
2. To describe the socio-economic conditions, health and food access of older refugees.
3. To identify the determinants of nutritional vulnerability among older refugees.

The study included people aged 50 years and older. Although it is acknowledged that it is not possible to give a single definition of 'the elderly', the WHO uses the age cut-off of 60 years to define old age (WHO, 1989). However older adults aged 50-59 years were also included since life expectancy is lower in developing countries. Moreover biological ageing may begin earlier due to undernutrition, exposure to disease, physical work patterns and harsh living conditions in general (Kalache, 1991).

## 5.1 Profile of study area

### *Geography*

Karagwe district is situated in the Kagera region, in north-west Tanzania. It borders Uganda in the north, lake Victoria in the east and Rwanda in the west (plate 5.1). The region is a highland area with temperatures usually ranging between 25 and 30 degrees Celsius. There are two rainy seasons per year: long rains fall from March to May and short rains from October to November. Rainfall is above 1500 mm (Unicef, 1990). East Rwanda, the refugees' origin, has very similar geographical characteristics.

### *Economy*

Kagera region is a rural area where the prevailing occupation is agriculture and often also livestock rearing. The main food crops are plantain, beans, maize and Irish potatoes. Beans and coffee are cash crops. East Rwanda is also predominantly a rural area inhabited by subsistence farmers who basically cultivate the same crops. An essential difference is that Rwanda is more densely populated, even the relatively less populated east.

Selected economic, social and health indicators are displayed in table 5.1. Although Rwanda's Gross National Product before the war was higher than Tanzania's, it does not seem to have resulted in a higher level of development, as Rwanda was worse off measured by social and health indicators.

Table 5.1 National figures of income and social and health indicators in 1991

Indicator	Tanzania	Rwanda
GNP/cap US\$	120	290
Life expectancy at birth (years)	51.5	46.5
Adult literacy rate (%)	55	52
Under five mortality (per 1,000)	165	185
Maternal mortality (per 100,000 live births)	600	700

Source: UNDP Human Development Report, 1996

### ***Ethnicity***

Ethnically 85% of the indigenous population of Kagera belongs to the Nyambo, Haya and Mbulu tribes. Over the past decades, people from Rwanda moved into the area, especially Tutsis in the late fifties. Although the Tanzanian national language Kiswahili is widely spoken, there is also a local regional language known as Kinyambo, that has more in common with Kinyarwanda, the national language in Rwanda. Although Rwanda is predominantly Catholic, other Christian and Muslim denominations occur in both countries.

## **5.2 Study location and population**

### ***Criteria for selecting the study population***

Kagera region had two large conglomerations of Rwandan refugee camps: five camps in Ngara district accommodating almost 500,000 people and five camps in Karagwe district with just over 122,000 inhabitants. The camps in Karagwe and their populations are listed in table 5.2. Plate 5.1 shows the location of Chabalisa II camp where fieldwork took place and plate 5.2 provides an overview of the camp.

Table 5.2 Karagwe refugee population as per 9 December 1995

Camp	Population
Chabalisa I	43,594
Chabalisa II	32,265
Kagenyi	15,616
Rubwera	22,897
Omukariro	8,893
Total	122,434

Source: UNHCR Karagwe

It was decided to carry out the research under the umbrella of HAI for logistical reasons and because they had built up a relationship with the older refugee community. Karagwe district was more suitable than Ngara district since there was regular social unrest in the Ngara camps and HAI had only just begun operating in Ngara. Chabalisa II was chosen as the best camp in Karagwe district for this study: the population was sufficiently large to draw a sample of the required size and the camp was well organised so that a random

# Numerous Originals in Colour



sample could be drawn (instead of cluster sampling) and people could be traced. Chabalisa II was a quiet camp and the refugees in Karagwe had more access to land than in Ngara.

Plate 5.1 Location of Chabalisa II camp



Plate 5.2 Overview of Chabalisa II



This older refugee population was likely to be different from other refugees in several ways. In the first place older adults are more likely than the younger to have stayed behind in Rwanda (voluntarily or abandoned), or to have died on their way to the camp or shortly after arrival. Hence older refugees who were still alive in the camp at the time of the research (a year after the height of the emergency) were presumably a select group of survivors. Secondly, there is reason to assume that the refugees were in a reasonable condition before departure. Thirdly, the study took place in the post-emergency phase and HAI had been present in the camp for more than a year, advocating for the interests of older people and providing support. Finally local circumstances such as the high level of sanitation, access to land, and the local demand for labour were atypical for a refugee situation and must have contributed to low morbidity levels and relatively more opportunities to supplement the diet.

### *Study area*

Chabalisa I and II were situated in the vicinity of local villages<sup>1</sup>, approximately 40 km from the Rwandan-Tanzanian border and 25 km from Kayanga, the administrative town in the district and the base of most NGOs. About fifteen NGOs (international and local) were assisting UNHCR in implementing the relief operation.

The first influx of refugees arrived mid April 1994 and in a relatively short period the numbers rose to over 100,000 in Chabalisa I. As the number overwhelmed the facilities and caused health, sanitation and security problems, the camp was decongested in October 1994 by moving about one third of the population to a newly established camp Chabalisa II, at three km distance. This planned move facilitated designing of the camp. The camp was organised in blocks that were sub-divided in sectors. Every household (defined as a group of at least four people) was allocated a plot (estimated average size 20 m<sup>2</sup>) to build a shelter (called "blende"). Pit latrines were dug between every four plots. Two rows of ten plots formed a sector. Various services like churches, a play ground, grave yard, communal gardens, and a mill were present. Annex 5.1 shows the lay-out of the camp.

---

<sup>1</sup> Local villages were quite dispersed. The camp even included some Tanzanian houses.

Chabalisa II covered an area of approximately 2 by 3 km and was crossed by a dirt road leading from Kayanga up to the Rwandan/Tanzanian border. NGO compounds and a market area were located in the centre, just above a swampy area in the valley. The blends were built against the slopes. Drainages were dug at regular intervals and the camp looked clean and well kept. Chapter 6 provides more information on camp conditions.

### ***Population***

The smallest administrative units in Rwanda were communes. People from two communes, Rukara and Kigarama, were settled in Chabalisa II. Although communes in Rwanda were socially not very cohesive, it gave the camp a unique feature as it still provided a sort of 'in-group' feeling. Chabalisa's inhabitants were mainly of Hutu origin, although there were also small numbers of Tutsi (e.g. mixed marriages). The refugees had elected commune leaders and sub-committees that dealt with issues such as security and public health education.

Chabalisa II had a population of 50 years and above of almost 2,700. However this figure is from an initial HAI survey that started in July 1994 and may be overestimated as initially also younger adults tried to get on the list to receive goods. It is unlikely that HAI missed a significant number of elderly as the survey and later checks were combined with distributions of goods. Initiated by HAI, elderly people elected their own representative, known as the elderly president.

## **5.3 Initiation of the study**

### ***Reconnaissance visit***

In the first phase of the project, a reconnaissance visit of three weeks was made to Tanzania in May-June 1995 to assess the feasibility of the research. Dar es Salaam as well as Karagwe district were visited and information was collected on demography, living conditions in the camp, the health and nutrition situation and interventions. It was concluded that it would be feasible to carry out the research in Karagwe district where HAI was operational and willing to provide support in various ways. The attitude of other organisations towards the research was positive.

Chabalisa II camp seemed to offer the best environment to conduct the research. However, it was noted that care should be taken with the political situation and possible sensitivity regarding adult anthropometry. Further, information was collected on logistics and budget and a more detailed planning of the field work was made.

#### *Pilot study*

A pilot study was organised in several elderly homes in London in August 1995. The purpose was to become familiar with the anthropometric measurements, ADL questionnaire and physical tests. It was not easy to find elderly people willing and able to participate, as many residents of the elderly homes were immobile or mentally impaired. Finally, 16 people were measured and techniques were checked by the project coordinator. Based on this experience, final decisions on equipment were taken and the research protocol was amended.

#### *Ethical aspects*

Before data collection commenced, ethical clearance was obtained from the LSHTM ethics committee. Formal approval was also given by UNHCR at the local, national and international level. Elderly people themselves were fully informed about the aim of the research and all measurements. Measurements would only be taken after they had given their informed consent by signature or thumb print (annex 5.2). Elderly people in need of further medical and/or social help were referred to the appropriate NGOs.

#### *Initiation at camp level*

A meeting was held with UNHCR and most NGOs operating in the camp to provide information about the research and ask for co-operation. The same was done by the research team in the elderly community through mass meetings organised in clusters of blocks. These were repeated halfway through the data collection when the response rate decreased slightly. The study was generally well received by the elderly.

### **5.4 Implementation of the study**

#### *The sample*

The calculation of the sample size required to estimate a simple proportion depends on the size of the population from which the sample is taken, the expected prevalence of the



factor of interest (e.g. undernutrition, impaired functional ability) and the level of accuracy required. Calculation of the sample size required to estimate the size of the effect of an exposure on an outcome depends on the size of the effect that is to be detected, the ratio of exposed to unexposed (i.e. the ratio of undernourished to adequately nourished) subjects in the sample, and the expected frequency of the outcome of interest (e.g. functional impairment) in the unexposed (e.g. adequately nourished) subjects. The sample size calculation is, therefore, based on several *estimates* of the parameters that cannot be known in advance with certainty. Since there is only little information available on the nutritional status of elderly Africans and no data at all on functional ability, sample size calculations were based on unpublished preliminary data from a similar study in India (Manandhar, 1999). Setting a confidence level of 95% (+/- 5%), various scenarios were tried using the sample size calculation module (STATCALC) of Epi-info v6.04b. Table 5.3 and 5.4 display figures for descriptive analysis. Since it was expected that older people were under-represented in the reference population and differences in age and sex can be assumed, four sub-groups were made: men aged 50-59 years and  $\geq 60$  years and women aged 50-59 years and  $\geq 60$  years.

Table 5.3 Sample sizes required to estimate the prevalence of undernutrition

	Men <60 yrs	Men $\geq 60$ yrs	Women <60 yrs	Women $\geq 60$ yrs
Estimated population size	841	368	996	494
Sample size a <sup>†</sup>	247	179	259	205
Sample size b <sup>‡</sup>	190	147	197	164
Sample size c <sup>°</sup>	119	101	121	108

<sup>†</sup> Based on 35% expected frequency of undernutrition (BMI<18.5) and 95% confidence interval of +/- 5%.

<sup>‡</sup> Based on 20% expected frequency of undernutrition (BMI<18.5) and 95% confidence interval of +/- 5%.

<sup>°</sup> Based on 10% expected frequency of undernutrition (BMI<18.5) and 95% confidence interval of +/- 5%.

It can be noted from table 5.3 that a 35% prevalence of undernutrition, as was observed in India, would require a sample size ranging from 179 to 259 per subgroup. However, based on malnutrition data among children in Chabalisa II that were collected during the reconnaissance visit, a lower prevalence of undernutrition among elderly people was expected. A prevalence of undernutrition of 20% and 10% gave sample sizes ranging from 147 to 197 and from 101 to 121 per subgroup respectively. Similarly table 5.4 illustrates that a defined proportion of 25% functional impairment (lowest 25<sup>th</sup> percentile), would require a sample size ranging from 162 to 223 per subgroup.

Table 5.4 Sample size estimates for descriptive analyses based on expected frequency of functional impairment

	Men < 60	Men ≥ 60	Women < 60	Women ≥ 60
Sample size <sup>†</sup>	215	162	223	182

<sup>†</sup> Based on 25% expected frequency of functional impairment and 95% confidence interval of +/- 5%.

A similar procedure based on the difference between two proportions was followed for analysis based on Indian data on handgrip strength and undernutrition (the data and formula can be found in annex 5.3). A confidence level of 95% and a power of 80% were used. The results are given in table 5.5.

Table 5.5 Sample size estimates for multivariate analyses based on expected frequency of functional impairment

	Men		Women	
	< 60 yrs	≥ 60 yrs	< 60 yrs	≥ 60 yrs
Ratio unexposed:exposed to undernutrition <sup>†</sup>	2:1	2:1	2:1	1:1
Exp.freq. of impaired function in unexposed <sup>‡</sup>	10%	30%	20%	40%
Relative risk to be detected <sup>°</sup>	3	2	2	1.5
Sample size per subgroup	165	168	435	300

<sup>†</sup> The total number of people with BMI ≥ 18.5 divided by the number with BMI < 18.5 (see table in annex 5.3).

<sup>‡</sup> The proportion with impaired handgrip among those with BMI ≥ 18.5 (see table in annex 5.3).

<sup>°</sup> Quotient of the proportion with impaired handgrip among those with BMI < 18.5 and the proportion with impaired handgrip among those with BMI ≥ 18.5.

After consultation with a statistician, it was decided that a sample size of 200 per subgroup would be sufficient. Multiplied by 4, this gave a total sample size of 800. Assuming a response rate of 80%, the sample size was increased to 1000.

Based on HAI's register, a list of the elderly population in Chabalisa II was compiled containing 2,699 people. The data base was entered on computer by block similar to the register. Then 250 people were selected randomly from each sub-group. For this purpose, four files were created with data of men and women over and under 60 years respectively. Sorting by block was undone by sorting on alphabetical order of the first name, that cannot be expected to interfere with randomness. Then all individuals were assigned a random 4-digit number, using a random number table and starting on a

random page (Kirkwood, 1988). Finally all files were re-sorted by the random numbers and the first 250 people of each list were included in the sample.

Non-responders were continuously followed up. When all 1000 people had been approached at least once, an extra 30 men and 30 women over 60 years were selected in the same way as the first sample was drawn. Out of the total number of 1060 people who were invited, 902 were actually measured. This resulted in a response rate of 85%.

### ***Recruitment and training of staff***

In the course of October and November 1995, a team of six Rwandans and two Tanzanians (four male, four female) was recruited in Chabalisa I and II, in Kayanga and in Dar es Salaam. Two Rwandan team members with good command of English (including the supervisor), were pre-trained for several days to make them familiar with essential concepts, translations in Kinyarwanda and with the measurements. During this process, a list of key words was produced that was later used in the training. Whenever a keyword came up, the team was made to write it down in Kinyarwanda and English.

From 20 November to 6 December 1995 a bi-lingual training was given to the entire team with assistance from the two pre-trained team members. Topics such as awareness raising about old age, the background to the research, theory and practice of all measurements, filling in data forms and dealing with elderly people were covered. All received an illustrated training handbook with descriptions of all measurements in both languages to refer to at any time. Two days of refresher training were given before resuming work after the Christmas holiday.

One Rwandan team member had left the camp over Christmas. His replacement did not cause substantial delay since a new recruit could readily be selected from the list of candidates that were interviewed before. Initially she was only trained in anthropometry by the supervisor and myself so that she was able to start working fairly soon.

### ***Pilot study***

Immediately after the training, a pilot study was organised to provide more practice in taking the measurements, conducting and testing the questionnaires and co-ordinating

the work. The smallest block in the camp was selected for this two-week exercise. The selected block was about half the size of the other blocks as it was the last to be filled during the move from Chabalisa I. There was no reason to expect it to be different from the others in any other way. This entire block was excluded from the study population before drawing the sample. Questionnaires were amended and techniques refined, based on experiences during the pilot study.

#### ***Logistics and communication***

A structure in the HAI compound made of wooden poles and plastic sheets with a hardened mud floor, served as camp office. This room was partitioned into several sections to allow for privacy during measurements and interviews. HAI's homevisitors assisted in inviting people to come to the camp office on a particular day and time. They usually accompanied elderly people to the compound. If people did not turn up, we investigated why and usually managed to persuade them to come. The few people who were housebound were collected by car or measured in their blendes as far as possible.

Once the elderly arrived in the camp office, the research would again be explained to them and informed consent secured. Following that, the measurements would be taken in rotation (preferably starting with the clinical screening but the order was usually determined by the availability of observers). Subjects would see different measurers for each measurement. Tea and a white roll were served after completion of all measurements. In-depth interviews were conducted during repeated home visits.

Although all team members were assigned specific measurements and tasks, they were able to take over from each other when necessary. The Rwandan supervisor co-ordinated and checked all activities, and also played an essential role in translation. Tanzanian and expatriate staff commuted to the camp since they were not allowed to stay in the camp overnight.

The handbook and questionnaires were translated into Kinyarwanda by the pre-trained team members. Back-translation of the questionnaires was done in the form of a team discussion. I would explain the purpose and content of the question, this was translated to the team in Kinyarwanda by the supervisor and in Kiswahili by the Tanzanian team

members (all team members understood Kiswahili). The team would then give feedback. This procedure was followed for all questionnaires.

## 5.5 Measurements

### 5.5.1 Anthropometry

Anthropometric measurements were taken by two female measurers in a fully partitioned room in the camp office. They alternated roles in measuring and recording. According to standardisation rules in anthropometry, measurements were taken on the left side of the body whenever possible. An exception was made for halfspan as tapes were designed in such a way that they would have to be read upside down when measuring the left arm, thus introducing error. Measurements were taken twice, except the biceps and triceps skinfolds that were taken in triplicate. Kyphosis and noticeable swelling of any part of the body were recorded, as these conditions may have implications for height, weight, skinfold and circumference measurements. In a few cases, arm and skinfold measurements were taken in sitting instead of in standing position, and kneeheight and calf circumference in sitting instead of in supine position.

#### *Weight*

Body weight was measured using a Soehnle 7300 electronic scale. The scale was placed on a wooden platform on the flat level floor in front of a pole to provide support while stepping onto the scale. Feet were drawn in the correct position<sup>2</sup> on the platform of the scale. Subjects were asked to take off any footwear, heavy clothes and remove heavy items from their pockets. No corrections were made for the weight of clothing or diurnal variation. The reading was taken to 0.1 kg accuracy while the subject was standing unassisted and still, looking straight ahead (Chumlea et al, 1987).

#### *Height*

A portable stadiometer was used to measure standing height (manufactured by CMS, London). The metal column with rubber spacers was fixed vertically to a wooden pole. A wooden platform with feet drawn in the correct position<sup>3</sup> was placed underneath on the flat level floor. The plastic head piece was replaced halfway through the field work as it

<sup>2</sup> Feet slightly apart, forefeet slightly pointing outwards.

<sup>3</sup> Heels together and touching the metal column, forefeet slightly apart.

wears out slightly. After removing footwear and headgear the subject would stand as erect as possible, with relaxed shoulders, arms hanging loosely at the sides with the palms facing the thighs. The head should be in the Frankfurt plane<sup>4</sup> (figure 2.1). To aid straightening the spine, the reading (to 0.1 cm accuracy) was taken while the subject was inhaling deeply (Chumlea et al, 1987).

Official guidelines to identify kyphosis do not exist. A person was identified (Ismail & Manandhar, 1999) as kyphotic if (s)he was unable to:

- stand against the stadiometer while touching the heels, buttocks, middle of the shoulders and back of the head to the metal column;
- straighten the legs.

Plate 5.3 Height measurement



<sup>4</sup> The imaginative plane that passes through the lower bones of the eye sockets and the small flap of skin on the forward edge of the ear.

### **Arm measurements**

A flexible steel tape (3 m Stanley tape model 32-031) was used for all long bone arm measurements and circumferences. The arm measurements were taken while the subject was standing erect and looking straight ahead, with the back against a wall to provide support. The arm(s) were extended laterally and parallel to the floor, with the palms facing forwards. The shoulders should be relaxed and elbow, wrist and finger joints straight (Lohman, 1988). Arm measurements were not taken in succession, but alternated with other measurements to give the arms rest in between measurements.

Armspan measures the distance across the front of the body between the tips of the middle fingers when the arms are extended at shoulder level (plate 5.4). The tape should cross the clavicles. As old people find this position tiring, the elbows were supported by the measurers and they were trained to work quickly though accurately. Halfspan is measured in a similar way with only one arm extended. It measures the distance from the tip of the middle finger to the centre of the sternal notch<sup>5</sup> (Kwok & Whitelaw, 1991). The demispan measurement excludes the fingers, as it is defined as the distance from the finger roots to the sternal notch (Bassey, 1986).

Plate 5.4 Armspan measurement



<sup>5</sup> The dip between the clavicles.

### ***Circumferences***

Mid-upper arm circumference (MUAC) is measured midway between the tip of the acromion and the olecranon process with the arm hanging relaxed besides the body, and the palm facing inwards (Gibson, 1990). Calf circumference is taken at the level where the reading is maximal with the leg in the same position as for the knee height measurement (Chumlea et al, 1987). Care was taken that the tape was wrapped horizontally around the limb and fitted snugly without compressing the tissue.

### ***Knee height***

Knee height was measured with a Mediform anthropometric calliper CLPR65 (manufactured by Beaverton, USA). It measures the distance from the sole of the foot to the anterior surface of the thigh and was taken according to Chumlea's description (1985), in supine position (on a mat on the floor) with the ankle and knee flexed to 90 degrees angle. The fixed blade of the calliper is placed under the heel of the foot and the sliding blade is placed over the anterior surface of the thigh, above the condyles of the femur, just proximal to the patella. The shaft of the calliper is held parallel to the shaft of the tibia and the measurement is taken while applying gentle pressure to compress the tissue surrounding the bones.

Plate 5.5 Knee height measurement





***Skinfolds***

A Holtain skinfold calliper was used to measure the biceps, triceps and subscapular skinfolds according to the methodology described by Lohman (1988). The skinfold was picked up approximately 1 cm above or under the location of the measurement, while the subject was standing upright, with relaxed arms hanging along the sides. The skinfold was grasped firmly between thumb and index-finger, making sure that muscle tissue was not included. The skinfold was held while taking the reading and released between measurements. The reading was taken to the nearest 0.2 mm after 3 seconds.

The triceps skinfold was taken at the midpoint of the back of the upper arm in a vertical position (plate 5.6). The biceps skinfold was taken at the same level and position on the front of the arm. Attention was paid that these skinfolds were picked up on the median aspect of the arm. The subscapular skinfold was measured just below and laterally to the angle of the shoulder blade, under an angle of 45 degrees from horizontal, in the same direction as the inner border of the scapula (Gibson, 1990).

Plate 5.6 Triceps skinfold measurement



Anthropometric variables were used to calculate derived variables. These were BMI based on height, armspan, halfspan and kneeheight. Further demiquet, mindex, upper-arm muscle area corrected according to sex (CAMA), total upper arm area (TUA), upper-arm fat area (AFA) and arm fat index (AFI) were calculated (formulae in annex 5.4). BMI variables were grouped into five categories according to the cut-off points 16, 17, 18.5 and 25 kg/m<sup>2</sup>, and used as such in the analysis (Shetty & James, 1994).

#### *Reliability and quality control*

Various measures were taken to ensure reliability and high quality. Measurement techniques were observed routinely to ensure they were up to standard. Equipment was checked daily and the weighing scale was calibrated regularly against a jerry-can with a constant amount of water (20 L). Data forms were checked continuously for obvious recording mistakes. To minimise intra-observer error, successive measurements were repeated if they did not agree within pre-set limits.

Frisancho (1990) suggested two error estimates to determine whether a series of anthropometric measurements can be considered accurate: the technical error of measurement (TEM) and reliability (R). The formulae are given in annex 5.5.

Inter- and intra-observer errors were calculated for all measurements (annex 5.6). Subjects who did not undergo the second measurement on the same day were excluded from error calculations for weight, skinfold and circumference measurements, to prevent imprecision due to physical fluctuations. Thirty-five subjects were measured twice for this purpose and no reference could be made to the previous measurement values (in fact the observers did not know which subjects would be included in the quality control sample).

The inter- and intra-technical error of measurement (TEM) was calculated using the formula for more than two measurements per subject and for two measurements per subject respectively (Frisancho, 1990). Both intra- and inter-observer errors were small enough to achieve a reliability of 0.98 and 0.99, indicating that the measurements were 98% and 99% error free. The only exception was a reliability of 0.91 for biceps skinfold measurements between observers, that may be due to the fact that this dimension is very

small and therefore the error constitutes a bigger proportion of the measurement value. Ulijaszek & Lourie (1994) recommend that for most purposes intra- and inter-observer reliability should be at least greater than 0.95. Thus anthropometric measurements taken in this study can be considered to be very reliable, with the possible exception of the biceps skinfold.

### 5.5.2 Independence in activities of daily living

The ability to perform basic daily activities in and around the house was assessed by self report. A questionnaire assessing independence in activities of daily living (annex 5.7) was used based on the Katz scale (1989), one of the most widely used and validated scales. The scale aims to appraise the degree of independence in six basic activities: eating, transferring<sup>6</sup>, dressing, bathing, toileting and continence<sup>7</sup>. Subjects would report on whether they were able to perform a particular task independently, or whether they required partial or total assistance. The answer was recorded as a score ranging from 0 to 2. Further the questionnaire included questions on basic mobility. In addition mobility was also recorded as observed by the interviewer. The wording was amended from the questionnaire used in India to adapt to the different cultural context.

### 5.5.3 Physical performance tests

The Indian protocol (Manandhar, 1999) was also largely followed for the physical tests. It included tests described in the NHANES III physical function examination protocol (1990) and by Bassey (1990). The tests were selected on the basis of suitability for community studies in developing countries (simplicity, involvement of minimum equipment, cultural appropriateness, low risk of falling/injuries) and measured the following dimensions: manual dexterity, flexibility, muscular strength, psychomotor co-ordination and cognitive function. The subjects were encouraged to perform to the best of their ability. The tests are described in the following sections.

<sup>6</sup> The ability to transfer oneself from the bed to a chair, from the floor to standing etc.

<sup>7</sup> Continence is quite distinct from the other ADLs in the sense that it refers to the ability to control particular muscles rather than (in)dependence in a certain activity.

### ***Cognitive function***

Short term memory was assessed by the object recall and word recall tests. For the object recall test, the subject was asked to look carefully for 1 minute at a tray with fifteen familiar objects<sup>8</sup>. In order to make subjects concentrate, they were asked to name the objects out loud. Then the tray was covered and after all other tests were finished, the subject was given 1 minute to recall as many objects as possible.

The word recall test also aims to measure short term memory with special emphasis on the ability to process and retain verbal information, an aspect that may be of specific interest in the daily life of illiterate people. After explaining the test, three words<sup>9</sup> referring to familiar things in their daily life, were mentioned slowly and clearly. The words were to be repeated by the subject immediately. The recalled number was recorded and after seven other questions were asked (approximately 10 minutes), the subject was asked to mention the words again. The second score was also recorded.

Cognitive function as observed by the nurse was recorded as well as assessed by a set of questions about the day, month and religious festivals (annex 5.8). Appropriate questions were formulated by the team after exploring the relevance in group discussions.

### ***Manual dexterity***

Manual dexterity was measured by the lock and key test. A simple padlock was held upright at the edge of a table by the observer. The key was on the table next to the lock<sup>10</sup> in such position that it did not need to be turned before insertion into the lock. The subject was seated on a chair in front of the lock and key, and was allowed to use only one hand. Timing was started as soon as the subject touched the key and ended at the moment the lock opened.

### ***Flexibility***

Flexibility of shoulder joints was assessed by two simple exercises: internal and external shoulder rotation. The exercises were demonstrated by the measurer and copied by the

---

<sup>8</sup> The following objects were selected by the team: pen, comb, lantern, straw, spool of thread, pipe, big nail, spoon, wrist watch, big coin, box of matches, battery, piece of soap, cup, key.

<sup>9</sup> The three words selected by the team were: moon, water, fire.

<sup>10</sup> Right from the lock for right-handed people, left for left-handed people.

subject, if possible in a standing position. For the external shoulder rotation the hands were put behind the neck at ear level, with the arms parallel to the floor and elbows pointed outwards (plate 5.7). For the internal rotation the arms were put behind the back at waist level, with fingers touching in the middle of the back near the spine and elbows pointing outwards.

Plate 5.7 External shoulder rotation



### ***Muscle strength***

Repeated chair rises<sup>11</sup> measured lower body muscle strength. The subject was seated on a chair of 47 cm height (placed against a wooden pole to steady it) with feet slightly apart on the floor and arms folded across the chest. The subject would first be asked to move forward while seated until half-way along the chair seat (arms remain folded) to assess trunk control. Then (s)he was asked to stand up once (with folded arms). If this

---

<sup>11</sup> Standing up from a chair and sitting down without using the arms was considered as one rise.

did not give problems, the subject would be timed doing this five times as fast as possible.

Upper body muscle strength was measured by the handgrip test for which a mechanical Harpenden handgrip dynamometer was used. Both hands were alternately measured in triplicate, with a final extra attempt on the preferred hand. This allowed the technique to become familiar and the subject to be given several chances to improve the reading. The measurements were taken in sitting position with the fore-arm resting across the stomach. After an explanation and adjustment of the dynamometer to the size of the hand, the subject squeezed the handle as forcefully as possible for a few seconds and released (plate 3.2).

#### ***Psychomotor coordination***

A plate tapping exercise was used to measure speed and coordination skills. The equipment was a table of 82 cm height with two circular discs (20 cm in diameter) fixed on to the table top with the centre of the discs 80 cm apart, and a rectangular shape fixed in between the disks. The subject would stand in front of the table (or sit if standing gave problems) in front of the rectangular shape, the feet slightly apart. The non-preferred hand would be placed on the rectangular shape and stay there. The other hand was moved as quickly as possible back and forward between the circular discs, touching them in the centre. The time to complete 25 laps was measured and inappropriate taps were excluded (plate 3.1).

The tests were taken in the following order: first part of memory test (looking at objects), lock and key test, external and internal shoulder rotations, chair stands, first plate tapping, handgrip test, second plate tapping, last part of memory test (recalling objects).

#### **5.5.4 Clinical screening**

A simple clinical screening involving observations and self-report was conducted by a trained nurse. The objective was to record symptoms of health conditions that may affect the nutritional status or functional ability. Blood pressure and pulse were measured with a battery-operated digital blood pressure monitor. As far as possible symptoms of the

following health conditions were looked for: loss of senses (especially sight and hearing), poor dentition, gastro-intestinal disorders (diarrhoea, constipation, vomiting, nausea, ascites), vitamin and mineral deficiencies (pellagra, scurvy, xerophthalmia, visible goitre), anaemia, respiratory infections (including TB), oedema, malaria, diabetes, arthritis, arthrosis, disability, depression, poor cognitive status, exposure to alcohol and smoking. Observations on kyphosis and oedema were also recorded. Subjects were asked to bring their out patient department card issued by the camp clinic, if they had one, to check medication. The screening protocol (annex 5.8) was developed on the basis of literature (Ross & Vaughan, 1986; Kroeger, 1983; Sandberg & Clausen, 1994), advice from LSHTM specialists in morbidity and mortality research, a medical doctor involved in similar research in Tanzania and medical doctors working for NGOs in the refugee camps in Karagwe.

Spinal curvature and oedema affect various anthropometric measurements. Therefore BMI was calculated based on armspan for kyphotic subjects and oedematous subjects were analysed separately (see 6.3 and 7.1). Presence of these conditions was recorded by the nurse as well as by the measurers in anthropometry. Their observations did not always agree (the conditions were generally not severe), but subjects were registered as kyphotic or oedematous when recorded so by either one.

#### **5.5.5 Other data collected**

Additional social, economic, dietary and demographic information was gathered using three different techniques: a structured questionnaire for all subjects, repeated in-depth interviews on a sub-sample (case studies), and group interviews.

##### ***Age determination***

Age was determined by a series of questions regarding local and personal events (annex 5.7). Where possible this was double checked with information from relatives, and from identity cards that had been issued in 1958 which many refugees were still carrying.

##### ***Structured questionnaire***

An extensive structured questionnaire was developed (annex 5.9), with questions addressing demography, history of movement, socio-economic status, customary

physical activities, diet, social network and support (social, financial and physical). The content of the questionnaire was based on literature and personal advice (Fillenbaum, 1984; Bowling, 1991; pers.com. Pottier) and was checked by a specialist in psychosocial trauma. To give an indication of food variety, frequency of consumption of 13 food groups representing the diet in the camp was recorded in the questionnaire. The research team advised on cultural appropriateness and cross-checked the translation into Kinyarwanda. This questionnaire was part of the routine measurements and was conducted in the field office by two interviewers. After the initial stage, these interviewers became more occupied with case studies and group interviews. Therefore additional training was given to other team members to enable them to conduct the questionnaire if necessary.

### *Case studies*

Besides the structured questionnaire, twelve case studies were conducted by two interviewers who had received special training. The case studies were open interviews that usually involved four to five home visits of several hours. A heterogeneous group of subjects was selected in the course of the field work on the basis of criteria such as sex, age, nutritional status and socio-economic situation. Characteristics of case study respondents are given in annex 5.10.

Again the case study protocol from India (Manandhar, 1999) was taken as a starting point and adapted to the different population and situation, and to vulnerability as the focus of this research. The interviewers took part in developing the protocol (annex 5.11) and conducted participatory exercises in the process, to experiment with different discussion techniques and topics. The protocol contains guidelines on discussion topics rather than pre-set questions. Discussion topics included household composition, biography, activity pattern, access to food and fire wood, food enjoyment and appetite, food practices and patterns, alcohol consumption, income and expenditure, sense of well-being and health, and personal relations and concerns.



Plate 5.8 Interview in blende



### *Group interviews*

The same two interviewers also conducted group interviews to collect other qualitative information. Elderly people who participated in these interviews were not necessarily all included in the sample. The interviews took place in another structure in HAI's compound. One of the first group interviews produced a history calendar based on historical events. This was used to develop a set of questions to determine age, which was included in the ADL questionnaire (annex 5.7).

Specific groups were formed with very old people (separate sexes), widows, home visitors and elderly labourers. Discussion topics included: food availability during the year, typical daily diet, fire wood, the concept of vulnerability and elderly labourers. Discussions regarding vulnerability followed the ranking methodology from rapid rural appraisal techniques (McCracken et al. 1988). The interviewees ranked a group of households known by all of them into categories of vulnerability, after which characteristics of each category were described.

### **5.6 Data handling and analysis**

Data were entered and analysed on different types of personal computers with the statistical programme SPSS/PC+ version 5.0 and 6.0 and its data entry package (SPSS Inc., 1993). In addition, several Microsoft applications were used such as Word and Excel.

Differences between sexes and age groups were assessed by applying the t-test for equality of unrelated means for continuous variables (after checking the data for normality). Equality of population variances was tested with Levene's test as required when using a t-test (Norušis, 1997). A  $\chi^2$ -test was used for categorical variables. Differences between more than two age groups were tested by oneway analysis of variance for continuous variables, using the b-tukey test to identify significantly different groups. Correlations were investigated by computing Pearson's Product Moment correlation coefficients. A statistical probability of  $<0.05$  was considered significant. Multiple linear regression was used in multivariate analysis while controlling for certain variables. Section 7.5.2 describes the followed strategy.

## 6. Qualitative results

As mentioned in the previous chapter, both quantitative and qualitative information was collected in this study. In this chapter, results obtained through mainly qualitative methods (observations and interviews with groups and key informants, socio-economic, health and dietary issues) will be presented first to give more insight in the study sample. The last part of this chapter and the next provide predominantly quantitative results (anthropometric measurements and functional ability assessment, determinants of vulnerability). The situation at the time of the research will be described, unless stated otherwise.

Twelve older people were interviewed in-depth to explore their support networks in the camp, their problems and personal views on some of the issues dealt with in this chapter. They also provide a valuable insight into the traumas experienced by refugees, their daily lives and their perceived needs. Summaries of the interviews are provided in annex 6.1.

### 6.1 Background to the study population and site

#### 6.1.1 Physical conditions in the camp

##### *Weather and housing conditions*

Chabalisa refugee camp was situated in a swampy valley, where nights and early mornings were damp and chilly. It was very dry and windy from June to September when damage to blendes caused by dust storms was not unusual. Most blendes were very small and constructed of materials such as wooden poles, grasses, cardboard, plastic, tin, cane and mud. Roofs were practically always made of plastic sheets that were distributed at the time of arrival. HAI monitored the coverage of distributed goods among elderly people and made sure that it was almost 100%. A blende was usually just one room (estimated average size 6-12 m<sup>2</sup>) with a separation as sleeping place and a cooking place outside. During the period of data collection, many blendes were being enlarged and improved by erecting mud brick walls around the old blendes. Houses of poor people in Rwanda were usually twice as big as the average blende, and middle class houses probably five times as big (pers.com. research team).

***Access to land and livestock***

Most households had a small kitchen garden around the blende. Further, a few refugees established relationships with Tanzanian farmers and worked as tenant-farmers, but rents had gone up quickly. Negotiations regarding cultivation of government grazing land in the immediate surroundings of the camp were ongoing. It was estimated that refugees had started to cultivate about 10-15 hectares in the immediate camp surroundings in spring 1996. As a result the Ministry of Home Affairs restricted the refugees' mobility (see 6.1.2).

Officially domestic animals were not allowed in the camps, but small animal husbandry (chicken, ducks, goats) was tolerated. Kagenyi and Rubwera camps were more spacious and had bigger kitchen gardens, more productive soils and fish and peat from a nearby lake.

***Fuel***

Improved cooking stoves were introduced by the NGO CARE and they were being used by 70% of the households. When properly designed and used, an improved stove can bring down the firewood consumption by 40%. Firewood consumption in the camps in Karagwe was about 2.5 kg/capita/day<sup>1</sup>. According to the refugees, the amount of firewood needed mainly depends on the type of meal (whole grain maize and beans take most time to cook) rather than the number of people.

The refugees collected firewood in the surroundings of the camp. At the time of the research there was not much wood left near the camp and they had to go as far as 15 km (refugees in Ngara had to walk 22 km). The price of a 5 kg bundle of firewood was TSh.100<sup>2</sup> and rose by 40% in the rainy season. In an attempt to restrict uncontrolled cutting, CARE distributed firewood (cut in a private property at 56 km distance) during several weeks towards the end of 1995, but stopped due to budget problems (pers.com. CARE). At the household level the distributed amount was approximately 10% of the total fuel consumption. Wood was only distributed in Chabalisa I and II as Rubwera and

<sup>1</sup> CARE stated that in Somalia and Sudan where wood was more scarce, firewood consumption was as low as 1 kg/ capita /day.

<sup>2</sup> 1 kg white maize grain cost the same and TSh. 600 was equivalent to 1 pound Sterling in Dec. 1995.

Kagenyi camps had access to peat as alternative fuel and Omukariro was a small and relatively new camp which had less impact on the environment.

Fetching firewood was very time-consuming. Young children (7 to 10 years) had to go twice to collect enough for one family meal since they could not carry heavy loads and go far. Older children used to go three times a week from the early morning until the early afternoon, carrying food with them. Some refugee children fetched water for local Tanzanians and were paid in firewood.

### *Water*

There were some water sources near Chabalisa I and II camps that provided sufficient water during the rainy season. In the dry season water needed to be transported by tanker from a place at approximately 60 km distance. The water supply for Chabalisa I and II was 10-15 L/ capita /day, but dropped to 3-4 L/ capita /day in the dry season when the sources dried up. Since water was only available from 8-12 and from 16-19 hours, people usually had to queue. Water was stored in tanks that were located in the camp and near the bore holes. Water treatment involved sedimentation by adding aluminium sulphate to desalt after which chlorine was added to disinfect.

### *Impact on the environment*

It is not surprising that a sudden influx of more than 122,000 refugees in a district with a local population estimated to be just over 362,000<sup>1</sup> has a significant impact on the environment. In Ngara the situation was worse: the 483,000 refugees greatly outnumbered the local population which was approximately 25% of refugee population.

Deforestation was the most obvious impact on the physical environment, and the refugees as well as the local population considered the lack of firewood as one of the main problems. It was also reported that the number of wild animals in the area had decreased. Another major problem was water availability. There was not enough water for the refugees and some Tanzanian villages seemed to have lost access to part of their water supply. Undoubtedly the competition for natural resources led to conflicts between the local population and the refugees.

---

<sup>1</sup> This figure was obtained from the 1988 census and was increased by 2.1% each year.

### 6.1.2 Socio-economic situation

#### *Political structure of the camp*

Each camp had a president who was elected by the refugees. In Chabalisa II each block had a male and female leader and commune leaders. It was their task to facilitate communication among the communes and with Tanzanian leaders.

#### *Mobility*

According to the 1965 Refugee Control Act, refugees were supposed to stay within the designated areas, i.e. within the camp boundaries. However the government had no capacity to enforce this law. Moreover it was unofficially acknowledged that the standard of living would be unacceptably low if refugees depended entirely on the distributed ration. Thus refugees were allowed to find daily supplements in the region, provided they were back by 18 hours. If they wished to travel longer distances, to town or to other camps, they were supposed to apply for a travel permit with the Ministry of Home Affairs.

Mobility was temporarily restricted by the Tanzanian authorities for six weeks during the Tanzanian elections in September and October 1995, and permanently restricted to a radius of 4 km from June 1996 onwards.

#### *Economic dynamics*

The arrival of the refugees and with them a battery of international and national organisations, generated a boost to the local economy. Immediately after the arrival of the refugees, prices of basic food commodities (e.g. maize, beans, plantain) rose by approximately 300%. As the organisations needed office space, houses and man power, rents and salaries also rose dramatically. After a while, when refugees also started to bring products on the market, food prices fell to a certain extent.

The camps were lively economic centres, especially Chabalisa I, with a big market where a wide range of commodities was available<sup>4</sup> due to the vicinity of small Tanzanian villages. Chabalisa II also had a market where predominantly food products were traded, but other materials such as fabrics, clothes and utensils were also available. The presence

---

<sup>4</sup> This market was not without reason called "Kigali" after Rwanda's capital.

of several bars, "restaurants", a bakery, bicycle workshop, hair dresser, "cinema" with video shows on a battery operated system, illustrate the level of economic activities. Socio-economic differences among the refugees developed like in any other society.

### ***Relationship with the local population***

It was quite common for refugees to work on Tanzanian farms. As labour is the limiting factor in the farming system in west Tanzania, the local population was quite pleased with refugee labourers as they were cheap and reputedly were hard workers. A qualitative survey carried out by CARE revealed that Tanzanian villagers were of the opinion that refugees could stay if insecurity problems and the negative impact on the natural environment could be resolved. The increased economic activity in Karagwe initiated by the presence of the refugees and the NGOs was appreciated by many people, although others thought it affected traditional social structures in a way similar to what is often seen in modern urbanisation processes; young people leave home to stay and trade near the camps but do not bring the earned money home (pers.com. Sawata, local NGO working for older people).

Security incidents had increased notably since the arrival of the refugees. Refugee groups were involved in robberies in Tanzanian villages and Tanzanians were reported to harass and mug individual refugees. Sexual violence was another problem that was not confined to camp boundaries; women and girls were raped or attacked for instance while fetching firewood. It was believed that both Rwandans and Tanzanians were perpetrators, although cases committed by Rwandans were hardly reported. The extent of the problem was realised when UNHCR formed camp committees of active and reliable people (e.g. older women who were trained for this task) to whom victims could report. Child prostitution was also said to occur in villages in exchange for food or firewood. UNHCR advised that children should only go to villages in groups, with at least one adult.

### ***Living arrangements and support***

There is no custom of living in extended families in Rwanda; traditionally elderly parents do not live with their adult children. Daughters usually stay with their parents until they marry, but sons may leave the parental house before marriage. When parents live on their own, a grandchild sometimes stays with them to provide help in the household.

Social networks in the camp in which elderly people participated were prayer groups, groups of women doing handicraft activities (usually in HAI's compound) and elderly working in HAI's community garden (plate 6.1). Apparently churches also played a role in mobilising the community to support vulnerable individuals.

Plate 6.1 Working in HAI's communal garden



Older people felt they were not as much respected by the younger generation as they were in Rwanda. However this may be a common feeling among adults since it was said that compared to the old days in Rwanda, there was less solidarity in the camp due to poverty and depression. Churches collected insufficient money to support the great number of vulnerable individuals. Younger people said they could not support the elderly adequately because they were poor themselves. Even assistance such as help in blende construction was not easily offered because one had to go far to collect materials and ran the risk of being harassed.

#### *Wage labour in local villages*

As mentioned refugee labour was welcome in the Tanzanian agricultural system. This was one of the most common ways to supplement the diet. In some cases Rwandese who had migrated earlier facilitated contacts. Payments were in cash or in kind (food). According to a group of older refugee labourers, women preferred to work for food instead of money, since the monetary value of food is higher than the money they would earn. Nevertheless men preferred to be paid in cash so that they could use part of the



money to satisfy personal needs. Wages were the same for men and women, but piece work was common which was to the disadvantage of slower workers like very young and older people. TSh. 150 was earned for a morning from 7 to 12 in villages close to the camp, but rates went up to TSh. 300 at longer distances.

## **6.2 Perceptions of vulnerability**

In order to get insight in older people's own perceptions of vulnerability, group discussions were held in various compositions: men and women separately, widows (mean age 74 years), very old people (mean age 80 years) and HAI's homevisitors. The concept of vulnerability is quite abstract and hard to explain to illiterate people. Therefore the Rwandan word "himibereko" was used which means well-being in its broadest sense (comprising social, economic, psychological and health aspects). The ranking methodology was followed and discussions were confined to the refugee situation.

According to older people themselves, main problems of the less well-to-do were:

1. Physical impairment.
2. No purchasing power, income, tools and utensils.
3. No people to provide assistance and moral support, social isolation.

Men and women came up with similar determinants of well-being, although it seemed that men tend to mention income generating capacity or purchasing power first and emphasise economic independence, whereas women mentioned more often having productive household members or others around to provide support (annex 6.2 shows men's and women's definitions of well-being). Similarly, homevisitors also identified those without jobs or physical working ability as the most vulnerable. They classified the least well-to-do elderly as:

1. Widows and widowers.
2. The physically impaired and disabled.
3. Those who live alone, have no children living nearby, have care giving responsibilities (e.g. for young children, old spouse).

Older people mentioned that they had insufficient clothing and blankets to remain warm. HAI identified in participatory exercises in all camps in Karagwe that insufficient or

inappropriate clothing also affected their dignity. Further boredom was observed as a problem, particularly for those people who were unable to work further from home (due to physical impairment or no access to (nearby) land). In Rwanda women in such situations used to engage in mat and basket making, but here raw materials were not available in nearby surroundings.

In Ngara district, UNHCR conducted interviews when the second influx of refugees was moving between transit centres from the border to the camps. Refugees themselves mentioned older people and children as the most vulnerable among them. They gave reasons such as exhaustion, undernutrition, health, suffering from rain and cold, separation from family members and lack of information (pers.com. UNHCR Ngara).

For widows and very old people working ability was the main criterion to identify vulnerable groups and they identified business men, those with jobs and wage labourers as the better-off. With minor differences in ranking order, the following vulnerable groups were mentioned: old widows/widowers, old people living alone or without younger adults or who care for young children, young widows/widowers with young children, the disabled and mentally disturbed, destitute women<sup>5</sup> and young orphans living without adults. As both groups found they suffer most, they put themselves on top of their respective lists. They stated that old people who are looked after by their children are still worse off than in Rwanda. Their explanation was that in Rwanda, children used to cultivate their parent's land, sharing the produce, and did not neglect their parents because they would inherit their land. However, as refugees, children have nothing to inherit from parents who have lost their property.

All widows lived with grandchildren and mentioned they gave priority to the children if food was insufficient. They stated that daughters generally help their parents more than sons. They were very concerned about old people who were neglected by mature children and feel a burden. One of them illustrated this with her personal situation: "I live next door to my son and we share a ration card. His wife always argues with me and is impolite. Now I behave like a child because I'm treated like a child; I just keep quiet. My daughter in law blames me for doing nothing, she says I just sit and eat. Things have

---

<sup>5</sup> For example young widows who become prostitutes to earn a living.

changed nowadays. Elderly people are treated like children and children behave as superiors." The others agreed that there was always something to do at home in Rwanda, even for weak people. Now they feel bored and are ashamed to ask assistance.

The very old group also mentioned that daughters were more helpful to their parents: "Even if a daughter becomes delinquent, she never forgets her parents". Particularly men seemed to be annoyed that they were expected to work according to their ability: "In Rwanda we would stay at home and just eat and sleep. Old people in Rwanda can benefit from what they have built up in the past. They get income from their plantations and there are people around to take care of them."

Witchcraft was also a discussion topic and was known in the camp. According to the widows anybody can be suspected of magical powers and if there is witchcraft in the house men and women are equally vulnerable. The group of older people however said that women are more often bewitched. It occurs that people in conflict, for example two wives of the same husband, are accused of witchcraft. If the traditional doctor diagnoses witchcraft and cannot cure it, the patient is often chased away or murdered.

Food and health was also discussed with older homevisitors. They characterised the diet as inferior to the Rwandan diet in terms of quantity and quality. Fresh maize used to be eaten roasted as a snack (the dried grain was kept as seed or chicken feed), however in the camp maize was eaten cooked as whole grain or as stiff or thin porridge. The distribution of beans was sometimes substituted by peas or lentils. However peas were thought to cause diarrhoea if eaten daily. Lentils were initially disliked and most Rwandans did not know how to prepare them. In summary, food was less tasty and palatable and relatively more food was lost due to inappropriate storage.

The relation between ill health and food was explained as follows. In the case of ill health, the stomach cannot "grind" the food, which causes diarrhoea and nausea. Undigested food appears in the faeces as the intestines fail to "select what food to absorb". Therefore ill people prefer to eat liquid food such as thin porridge and soup. Children and old people are less able to digest whole grain and therefore suffer much from abdominal discomfort.

### **6.3 Risk factors emerging from the case studies**

One of the most striking things described in the case studies is that nearly all respondents had traumatic war experiences and had lost a great number of relatives. The current economic situation, health and access to food were much worse than in pre-war times. Some respondents had been very ill during the acute emergency phase and had never returned to their previous level of functioning. Perceived health also seemed to be interwoven with socio-economic conditions. The combination of poor functional ability and the absence of family members made it hard for them to cope. However it also occurred that relatives lived nearby but were unable or unwilling to provide support. There was great concern regarding food, although it should be noted that specific questions on food were asked. Some respondents noticed that the younger generation accorded less respect to elders and were worried about dying in exile.

In summary the following risk factors were widely prevalent in this sub-sample:

- Food access and intake: insufficient (good quality) food available, poor appetite, chewing problems, limited access to preferred food.
- Health: poor self-perceived health.
- Functional ability: poor working ability.
- Support/family life: inadequate support, having care giving responsibilities.
- Socio-economic situation: poverty, decreasing respect from younger generation.
- Psychological/emotional: trauma, bereavement, anxiety, boredom.

### **6.4 Characteristics of the study sample**

Data were collected on 902 subjects but 892 remained after data cleaning. Of them 7.2% (n=64) had slight or mild oedema and were therefore analysed separately. Thus the population for the main analysis included 828 subjects. Table 6.1 shows the size of subgroups according to age and sex.

Table 6.1 Age and sex distribution of the sample

Age and sex distribution	Men	%	Women	%	Total
50-59 years	189	49.6	192	50.4	381
60-69 years	153	49.4	157	50.6	310
≥70 years	71	51.8	66	48.2	137
Total	413	49.9	415	50.1	828

Age ranged from 50 to 92 and the mean was 61 years. In the ≥70 years age group, the mean age was 75. Some form of kyphosis was observed in 5% ( $n = 41$ ) of the population examined. There were no significant sex differences in kyphosis, however the prevalence was considerably higher in the ≥70 years age group.

The descriptive analysis will be guided by a comparison between the sexes and age groups. For the latter, three age groups will be used that were, after initial analysis, found to be most demonstrative: 50-59, 60-69 and ≥70 years.

#### 6.4.1 Social and economic characteristics

The vast majority (97%) of the elderly sample came from villages in Rukara and Kigarama communes in east Rwanda and had fled to Chabalisa between April and September 1994. For most of them the journey was a matter of days or weeks during which they stayed in the bush or in local villages. Table 6.2 summarises demographic characteristics and statistical differences between sexes and age groups <60, 60-69 and ≥70 years (prevalence by age is provided in annex 6.3). In the camp, nearly 60% of the elderly lived in some form of partnership<sup>6</sup> (73% were men, 27% were women). Just over 40% lived without a partner<sup>7</sup> (16% were men, 84% were women). Of the sample, 35% was widowed, of whom 83% was female. The educational status was generally low; 71% was illiterate, 8% had received adult or informal education and only 21% had received formal education. Three-quarters of the women had given birth to 8 children or more. In Rwanda, 93% of the sample had been farmers and 31% owned both land and livestock. As cattle are the symbol of wealth in Rwanda, it can be assumed that they were of reasonable socio-economic status. The 6.5% who reported that they were civil servant or privately employed (usually businessmen), were presumably also better off. The majority,

<sup>6</sup> Civil or traditional marriage, remarried, staying together but unmarried.

<sup>7</sup> Widowed, divorced, separated, never married.

just over 62%, had been small farmers before the war, owning land and perhaps just a few cattle. Their socio-economic status would have been moderate and significantly more women fell into this category. Women and the  $\geq 70$  years age group were significantly more likely to be widowed (or divorced/separated) and illiterate.

Table 6.2 Demographic characteristics by sex and age

Demographic characteristics	% Men	% Women	% Total	$\chi^2$ sex	$\chi^2$ age
Marital status			n=826		
Married	86.7	32.4	59.4	255***	31.8***
Widowed	11.9	58.5	35.2		
Divorced/separated	1.5	9.2	5.3		
Educational status			n=825		
Illiterate	55.5	87.0	71.3	113***†	25.3***†
Informal education	9.5	6.8	8.1		
Standard 1-6	32.4	6.3	19.3		
Higher formal education	2.7	0.0	1.3		
Occupation in Rwanda			n=825		
Landless farmer	0.2	0.0	0.1		
Farmer with land	52.6	75.5	62.5	34.1***‡	9.1*‡
Farmer (with land and cattle)	35.3	26.3	30.8		
Civil service/private	11.9	1.2	6.5		
Current economic status			n=820		
Can afford to offer drink	47.8	28.2	37.9	33.6***	50.1***

Significance levels: \*\*\* $p < .001$ , \* $p < .05$

† The categories 'higher formal education' and 'standard 1-6' were merged for this analysis.

‡ The categories 'farmer with land and cattle' and 'civil service/private' were merged for this analysis as well as 'farmer with land' and 'landless farmer'.

It was reported that there was no real poverty in the area of origin. Basic needs were met in most families. As an indicator of current economic status, people were asked whether they could afford to offer a drink to guests (anything other than water) as such hospitality is only abandoned if economic need is great. Not surprisingly the economic status as refugees was poor for quite a number of people. More than 60% in the camp said they could not afford to offer a drink, and among them was a significantly higher proportion of women and older people.

Information regarding living arrangements and care is given in table 6.3 and annex 6.4. It is remarkable that very few elderly lived alone (2%) or without younger adults (4%). Most older people lived with and were cared for by a number of relatives. Knowing this, it was anticipated that the majority was being cared for by relatives in case of illness, although friends and neighbours also seemed to play an important role. Men were more likely to live with their spouse and/or child(ren) and receive care from spouse and/or son (in law). Women were more likely to live with and receive care from grandchildren. Significant associations with age were found for living without younger adults and living with and being cared for by spouse and (grand)children. Older age groups were less likely than the younger to live with and receive care from their spouse and children when ill, but more from grandchildren instead.

Table 6.3 Living arrangements and care

	% Men	% Women	% Total	$\chi^2$ sex	$\chi^2$ age
Living arrangement			n=826		
Alone	1.9	2.4	2.2	0.2	-
Without younger adults <sup>†</sup>	4.6	3.6	4.1	0.5	16.1***
Spouse	86.2	30.9	58.5	260***	26.7***
Child(ren)	89.9	80	84.9	15.6***	54.3***
Grandchild(ren)	22.3	49	35.7	64.1***	77.0***
Other relatives	5.6	8.2	6.9	2.2	0.6
Unrelated persons	4.4	5.3	4.8	0.4	3.4
Receiving care from			n=826		
Spouse	84.7	30.0	57.3	253***	34.1***
Son <sup>‡</sup>	68.0	56.3	62.1	12.0***	32.9***
Daughter <sup>‡</sup>	66.7	60.9	63.8	3.1	40.9***
Grandchild(ren)	8.0	25.8	16.9	46.7***	66.6***
Other relative	7.0	8.5	7.7	0.6	1.0
Friend/neighbour	38.6	42.8	40.7	1.5	1.6
NGO/others	1.5	2.7	2.1	-	-
Nobody	0.7	0.5	0.6	-	-

Significance levels: \*\*\*p&lt;.001

<sup>†</sup> Alone or only with spouse<sup>‡</sup> Including in-laws

In this camp at least some care was provided to older people, but largely through the provision of material goods. Considering material support (table 6.4 and annex 6.5), virtually all elderly had received one or more type of goods (mainly from NGOs). Distribution coverage of soap, blankets and clothes among the elderly was very high and 99.5% of the men and 97.6% of the women had received a plastic sheet. This was probably due to extra non-food distributions for the elderly by HAI. Like received money and food, goods were mainly used for household purposes. Women were more likely than men to receive food and money and older people were more likely than younger to receive money.

Table 6.4 Material and financial support<sup>†</sup>

Support	% Men	% Women	% Total	n	$\chi^2$ sex	$\chi^2$ age
Food received <sup>‡</sup>	14.6	28.5	21.5	822	23.4***	3.8
- used for househ. cons.	96.5	93.2	94.3	174	-	-
- received from children	55.0	58.5	57.3	178	0.2	0.8
- received from friends or neighbours	41.7	36.4	38.2	178	0.5	0.5
Money received <sup>‡</sup>	13.6	20.5	17.1	826	7.0**	7.9*
- used for househ. cons.	89.1	86.6	87.6	137	0.2	-
- received from children	60.7	65.5	63.6	140	0.3	3.7
- received from friends or neighbours	25.5	25.0	25.2	139	0.0	1.0

Significance levels: \*\*\*p<.001, \*\*p<.01, \*p<.05

<sup>†</sup> Headings preceded by a hyphen are a sub-sample of the preceding main heading and their percentages refer to that particular sub-sample.

<sup>‡</sup> Received as a gift from outside the household. The frequency varied from occasionally to daily.

One of the dimensions of a social network is emotional support. Emotional support includes the sense of being loved and valued and may be particularly important for morale. Questions addressing perceived emotional support were "Are there people around to talk to when you need it?" and "Are there people you can share your deepest feelings with?" The vast majority answered these questions in the affirmative.

As indicators of respect for older people, the elderly were asked whether they were consulted by relatives or friends in case of problems and whether they had to pay for



assistance that people gave them (table 6.5 and annex 6.6). Nearly all respondents said they were consulted and did not pay for assistance.

Men were more likely than women to have people to share their feelings with, to be consulted and to pay for assistance. The oldest age group was more likely not to be consulted.

Table 6.5 Respect and emotional support

Respect	% Men	% Women	% Total	n	$\chi^2$ sex	$\chi^2$ age
Consulted	93.4	87.7	90.5	825	8.0**	7.0*
Never pays for help	90.5	95.7	93.1	826	8.4**	-
Emotional support						
Has people to talk to	98.8	98.6	98.7	826	0.1	-
Shares feelings	96.4	91.3	93.8	823	9.2**	1.1

Significance levels: \*\* $p < .01$ , \* $p < .05$

The older refugees were remarkable active as shown in table 6.6. They were involved in light household tasks (food preparation, cleaning etc.), heavy household tasks (fetching water and firewood, chopping wood, beer brewing, construction/repair etc.), child care and some were doing handicraft or even attended adult literacy classes (Kinyarwanda or Kiswahili). Many elderly were also economically productive as wage labourers, employees of NGOs (e.g. as guard, teacher, homevisitor) or in other income generating activities (selling goods, masonry, carpentry, making clay bricks, bicycle repair, hair dressing). Gardening seemed to be one of the favourite activities. Most Rwandan refugees liked it and some even claimed that current health problems were caused by the fact that they no longer cultivated land. An elder in HAI's community garden stated that working in the garden relieved joint pain: "Gardening helps to warm up the blood so that we feel better". It can be noted from table 6.6 that women were more likely than men to be engaged in light household tasks and child care, whereas men were more liable to do heavy household tasks and paid labour. People of higher ages were less likely to be active in gardening, heavy household tasks and paid labour (see annex 6.7).

Table 6.6 Activities of older people (n=826)

Activities	Men %	Women %	Total %	$\chi^2$ sex	$\chi^2$ age
Gardening	74.0	69.8	71.9	1.8	56.9***
Heavy household tasks	46.8	37.0	41.9	8.3**	8.7*
Light household tasks	46.4	95.4	70.9	241***	5.3
Child care	2.2	12.6	7.4	32.5***	3.5
Paid labour†	38.6	19.6	29.1	36.3***	58.5***
Unable to do any activity	2.4	2.2	2.3	0.1	-

Significance levels: \*\*\*p&lt;.001, \*\*p&lt;.01, \*p&lt;.05

† Probably underreported as this is officially illegal for refugees.

Plate 6.2 Mat making



**6.4.2 Health and clinical signs and symptoms**

Common health complaints of elderly seen by the nurse were: back pain, abdominal discomfort, joint pain/arthritis, fever (malaria was common in the camp), poor eyesight, cough and scabies. Many people seemed to relate health problems to the diet. They also tended to define their health status in socio-economic terms. Even people who had never visited the camp clinic said: "How can I say that I am healthy when I am eating maize and I have nobody left!" The case studies (annex 6.1) help to understand self perceived health and changes in individual health status over time.

Background information about the health situation of the refugee population is given in annex 6.8. Here, data from the clinical screening and health questionnaire are presented. The symptoms mentioned in table 6.7 and annex 6.9 refer to the presence of that particular symptom in the previous week, unless stated otherwise.

Table 6.7 Prevalence of clinical signs and symptoms by sex and age (n=828)

Signs and symptoms	men %	women %	total %	$\chi^2$ by sex	$\chi^2$ by age	$\chi^2$ men by age	$\chi^2$ women by age
Poor health (self report)	9.7	15.4	12.6	6.1*	44.8***	18.1***	27.8***
High blood pressure <sup>†</sup>	13.8	23.9	18.8	13.7***	10.4**	7.7*	4.2
Loss of senses							
Poor sight	21.8	24.1	22.9	0.6	108***	-	-
Poor hearing	0.5	0.7	0.6	-	-	-	-
Redness conjunctiva	13.8	10.4	12.1	2.3	19.4***	-	-
Excessive eye pus	4.6	5.1	4.8	0.1	4.9	-	-
Whiteness lens	3.2	4.8	4.0	1.5	22.1***	-	-
Dentition							
Missing teeth	43.6	53.7	48.7	8.5**	24.7***	7.0*	22.2***
Chewing problems	44.1	49.6	46.9	2.6	28.2***	5.8	27.1***
Food not eaten <sup>‡</sup>	29.8	34.7	32.2	2.3	46.2***	5.5	53.9***
Gastro-intestinal disorders							
Watery stool > 1 wk	1.4	1.0	1.2	-	-	-	-
Pain defecation > 1 wk	12.3	13.0	12.7	0.1	0.9	-	-
Nausea	10.7	14.9	12.8	3.4	0.8	-	-
Vomiting	3.1	6.7	5.0	5.7*	3.3	-	7.0*
Vitamin/mineral deficiencies							
Pale conjunctiva	2.9	1.4	2.2	2.1	-	-	-
Sore gums	7.5	9.4	8.5	1.0	1.5	-	-
Bleeding gums (spont.)	1.2	1.4	1.3	0.1	-	-	-
Wound healing >2 wk	5.3	2.4	3.9	4.7*	0.1	-	-
Respiratory infections							
Cough > 1 wk	20.8	22.9	21.9	0.5	3.5	-	-
Bloody sputum	1.2	0.7	1.0	-	-	-	-
Dyspnea	4.4	2.7	3.5	1.8	2.7	-	-
Fever							
Sweating/shivering	14.0	20.7	17.4	6.4**	1.1	2.5	7.0*
- for > 1 wk (n=143) °	63.8	74.1	69.9	1.7	2.3	-	-
Functional ability							
Arthritis	4.9	11.4	8.1	11.7***	34.3***	-	23.2***
Depression symptoms							
Frequent in last year	14.5	29.4	22.0	26.7***	0.5	-	-
Exposure to							
Alcohol	78.5	51.3	64.9	66.8***	8.1*	2.9	6.8*
Smoking	66.6	53.0	59.8	15.9***	1.8	-	-

Significance levels: \*\*\*p&lt;.001, \*\*p&lt;.01, \*p&lt;.05

<sup>†</sup> Defined as >140/90 mm Hg<sup>‡</sup> Mainly maize grain and meat that were not eaten because of dentition.<sup>°</sup> Sub-sample of the preceding main heading and percentages refer to that particular sub-sample.

The recorded symptoms can roughly be divided into two categories: senses/disability and diseases. The most commonly occurring physical symptoms in the first category were chewing problems (47%), poor eyesight (23%) and impaired mobility (21% unable to walk without a walking stick). In the category of diseases, cough (28%), high blood pressure (19%), fever and nausea appeared most frequently. Frustrations about (whole grain) maize as the main component of the diet was likely to have caused complaints about chewing and nausea. Although the observed cognitive status was good (only 2% were impaired), 35% reported they had frequent memory problems.

Remarkable for a refugee population was the relatively small number of people with clinical signs of vitamin and mineral deficiencies (probably because of the fortified CSB), gastro-intestinal disorders, cough with bloody sputum (symptom of tuberculosis) and symptoms of anxiety or depression. The following signs were absent: enlarged thyroid gland (apart from one case), hyperpigmentation around the neck, sore tongue, ascites and use of insulin. People with anxiety or depression problems mentioned the following symptoms most often: palpitations (70.8%), insomnia (63%), crying (27.8%), headache (22.5%) and lack of appetite (19.5%).

Men were more likely than women to have a prolonged wound healing time and to smoke and drink alcohol. Women were more likely than men to have high blood pressure, report poor health, missing teeth, vomiting, fever symptoms, arthritis, and frequent memory problems and anxiety symptoms. When age groups were compared, significantly more problems with increasing age were reported in vision, red conjunctiva (symptom of conjunctivitis), whiteness of lens (symptom of cataract), chewing, food avoidance because of dentition and performance in the verbal memory test. Men had significantly more problems with increasing age in general health, memory, missing teeth and high blood pressure. With increasing age women had significantly more arthritis (almost always in the knee joints), missing teeth, vomiting, fever symptoms, they consumed less alcohol and reported being in poor health.

### 6.4.3 Food and diet

#### *Ration composition and distribution*

Since refugees officially do not have access to land and only have restricted mobility, they depend on the international community for food and other basic items and services. Table 6.8 provides an overview of the food basket as distributed per capita per day in 1996. Items like sorghum, rice, dried fish and biscuits were included occasionally.

Table 6.8 Composition of general food ration in 1996 and macro-nutrient value

Item	Quantity/ capita/day	Fortified with	Energy (kcal)	Protein (g)	Fat (g)
Maize grain/meal	400/350 g	-	1,400/1,260	40/31.5	16/12.3
CSB (corn soya blend)	30 g	Ca, Fe, vit. A, B1, B2, B3, C	114	5.4	1.8
Pulses <sup>†</sup>	120 g	-	402	24	1.4
Vegetable oil	20 g	vit. A	177	-	20
Salt	5 g	I	-	-	-
Total			1,953-2,093	60.9-69.4	35.5-39.2
% of kcal				12.5-13.3	16.4-16.9

Source: UNHCR Karagwe (1996), WFP/UNHCR (1997)

<sup>†</sup> Beans if available, but peas or lentils were also distributed. Energy, protein and fat calculations are based on beans.

The World Food Programme was responsible for mobilisation and transportation of all food for general and supplementary feeding programmes and provision of milling facilities. UNHCR was responsible for the final distribution and for mobilising complementary food<sup>8</sup> (WFP/UNHCR, 1997). In April 1994 food distribution started with 1,850 kcal/capita/day in Karagwe. Initially the supply was erratic and the distribution chaotic. In 1995 the planned ration was increased to 1,950 kcal, but short term supply problems still occurred. At such times half rations were distributed or items were lacking<sup>9</sup>. When possible, UNHCR compensated for the lack of calories by distributing dried and canned fish. Initially the ration was determined assuming sedentary activity levels<sup>10</sup>. Later this was proved to be inappropriate and the energy content was

<sup>8</sup> For example local fresh foods and dried and therapeutic milks.

<sup>9</sup> In 1995 there was no oil for three months and in May 1995 no pulses were distributed for three weeks.

<sup>10</sup> Standard activity levels, population distribution, body size, ambient temperature and pre-emergency nutritional status were assumed.

officially increased to 2,100 kcal/capita/day based on a light activity level (WFP/UNHCR, 1997). From December 1995 onwards WFP and UNHCR planned in Tanzania for a ration of 2,150 kcal. The extra 50 kcal probably accounted for losses.

It is hard to estimate how much food was actually received per person, let alone consumed. Some food inevitably got lost or disappeared. Food basket monitoring revealed that on average 90% of the planned ration was received during December 1995-February 1996. This figure will presumably have been lower in the beginning when food distribution was not yet well organised. On the other hand, a verification exercise in December 1995 revealed that there had been 20% over-registration in Chabalisa II as well as in the other camps in Karagwe district (UNHCR Karagwe).

Initially food was distributed at the household level. This meant that one household member had to queue for several hours every fortnight. There were queues for different blocks in the camp and the elderly got priority so as to reduce their waiting time. In spring 1996 the system was changed after the example of Ngara. Food was then distributed to sectors which were groups of 20 households living next to each other. As the households knew each other, social control prevented problems when dividing the food among themselves. In the new system, the distributors dealt with fewer individuals and bigger quantities, making it possible to weigh the amounts instead of scooping. This was more accurate and less sensitive to cheating and resulted in a higher proportion of the targeted ration being actually received. Furthermore carrying the food home as a group provided more security. It had happened occasionally that the ration was taken from vulnerable individuals on their way home.

#### ***Ration supplementation and typical diet***

The refugees in Karagwe district were fortunate in that they did not entirely depend on the distributed food. Particularly around both Chabalisa camps, there was a need for agricultural labour. Moreover, Chabalisa II was a relatively spacious camp where 95% of the households reported having a small kitchen garden, although vegetables from gardens and the market were scarce from May to September. Besides this, trading was common

and about 20% of the respondents also cultivated other land<sup>11</sup>. The most commonly cultivated crops were green vegetables and beans, but other vegetables, sweet potatoes, sorghum, sunflower and maize (to be eaten fresh) were also popular. The produce was almost exclusively for household consumption according to the respondents. Refugees could not grow plantain as locally it was not allowed to plant trees on land that is not one's property.

The typical daily diet in the camp was described as follows:

Morning: porridge from maize meal (and CSB) and water.

Midday: maize 'ugali' (stiff porridge) with a relish of beans and green vegetables (in season).

Evening: same as lunch although vegetables were less often included.

Drinks: water, beer or juice (from plantain or sorghum).

According to the study population their daily diet in Rwanda was much more varied, quantities were bigger and the staple food was plantain instead of maize. It also included meat, fish and milk. Milk was considered to be an important food to stay healthy, particularly for older people. It was believed to cure abdominal pain and oedema. Further beer, tender meat and beans were believed to be good food for older people.

Beer is very important in the Rwandan culture and is made of sorghum, plantain or a mixture. Due to the scarcity of plantain for refugees, they developed a method to brew maize beer. Unlike plantain and maize beer, sorghum beer generally does not contain alcohol. Beer is considered to be a food and Rwandans traditionally start to drink it from the time they marry. It is especially important for the elderly to have a beer regularly, although it may reduce their food intake. Poor people drink thin porridge instead of beer. Water is only taken in case of excessive thirst.

#### *Food variety and satisfaction*

Table 6.9 gives insight into the frequency of consumption of various food groups. Maize and pulses were consumed on a daily basis by the majority of the people and CSB, cooking oil and green vegetables several times a week. On the contrary, animal products

---

<sup>11</sup> This is likely to be underreported. Grazing lands in the vicinity of the camps were illegally cultivated, particularly from the beginning of 1996. Perhaps the reduction of over-registration boosted this trend.



and fruits were seldom eaten. It is remarkable that 16.6% ate cooking oil less than once a week, although it was included in the general ration. This can be explained by the fact that cooking oil was the most commonly sold and exchanged ration item and prices seemed to fluctuate according to the days of food distribution. Poor people particularly used to sell cooking oil (and other items) in order to acquire other food and goods (see case studies in annex 6.1).

Table 6.9 Frequency of food group consumption (%)<sup>a</sup>

Food group	Never		Occasionally		1-6 times/week		Daily	
	men	women	men	women	men	women	men	women
Maize	1.0	1.7	2.2	1.9	26.7	22.2	<b>70.1</b>	<b>74.2</b>
Cereals <sup>b</sup>	<b>54.4</b>	<b>58.5</b>	40.0	39.1	5.4	1.9	0.2	0.5
Non-cereal staples <sup>c</sup>	16.1	18.4	40.1	<b>50.1</b>	<b>43.1</b>	30.0	0.7	1.5
Corn soya blend	1.5	2.7	1.7	1.9	<b>80.8</b>	<b>82.5</b>	16.1	12.8
Pulses	0.0	0.0	1.0	0.2	16.3	21.6	<b>82.7</b>	<b>78.2</b>
Nuts and seeds	<b>88.8</b>	<b>87.4</b>	8.5	8.7	2.5	3.6	0.2	1.2
Cooking oil	5.6	5.8	1.9	2.4	<b>67.5</b>	<b>73.0</b>	25	18.8
Meat, fish, eggs	<b>86.9</b>	<b>91.5</b>	11.2	7.0	1.9	1.5	0.0	0.0
Milk	<b>98.3</b>	<b>99.3</b>	1.2	0.5	0.2	0.2	0.2	0.0
Green vegetables	1.2	1.0	7.1	5.6	<b>72.2</b>	<b>70.5</b>	19.5	23
Other vegetables	10.9	14.7	34.7	38.9	<b>48.8</b>	<b>41.3</b>	5.6	5.1
Orange/yellow fruit	<b>94.9</b>	<b>95.9</b>	3.6	3.6	1.2	0.5	0.2	0.0
Other fruit	<b>92.2</b>	<b>93.2</b>	6.6	6.1	1.2	0.7	0.0	0.0

<sup>a</sup> The highest proportions per group are highlighted.

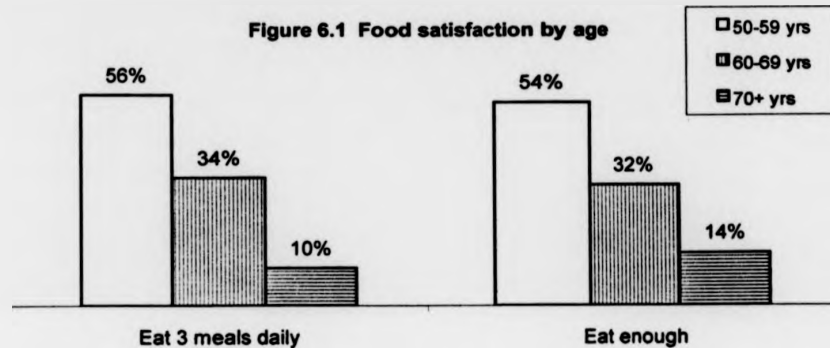
<sup>b</sup> Cereals other than maize.

<sup>c</sup> For example plantain, cassava, sweet potatoes.

A weekly dietary diversity score was computed. Food groups consumed at least once a week were coded 1 and those consumed less than once a week 0. This was summed per individual and gave a score ranging from 2 to 10. Approximately 10% of the population weekly consumed only four food groups or less. These presumably included maize, pulses and CSB, with most other food groups eaten less than once a week.

The case studies indicate a strong dissatisfaction with the diet: maize as staple and lack of diversity were the main complaints. There were also indications that older people gave

up a portion of their food in favour of other family members in times of shortage. Of the total sample, only 42% of the elderly had three meals per day (counting porridge as a meal) and 62% said they usually did not eat enough. Women were less likely than men to eat enough ( $P<0.05$ ) and figure 6.1 shows that older age groups were less likely to eat enough or to eat three meals per day ( $P<0.001$ ).



### ***Food preparation***

More than 87% of the older people did not always need to prepare their food themselves. Women were more likely to cook themselves than men, or to have food prepared by a grandchild. Men were more likely than women to have food prepared by their spouse. Significant associations with increasing age were found for not receiving assistance in food preparation (contrast in women only in  $<60$  versus  $\geq 60$  years age group) and having food prepared by a grandchild rather than a child (including spouse of child). Statistical details are given in table 6.10 and annex 6.10.

Plate 6.3 An old women cooking in her blende



Table 6.10 Food preparation by sex and age (n=826)

Food preparation by	Men %	Women %	Total %	$\chi^2$ sex	$\chi^2$ age
Self	20.1	87.4	53.9	376**	1.7
Spouse	83.5	4.6	43.9	522**	3.6
Daughter <sup>†</sup>	61.7	57.5	59.6	1.5	39.4**
Son <sup>†</sup>	20.6	17.4	19.0	1.4	13.2**
Grandchild	5.3	19.8	12.6	39.3**	57.1**
Other relatives	1.9	1.9	1.9	0.0	-
Friends or neighbours	0.5	0.7	0.6	-	-
Subject receives help	94.9	80.2	87.6	40.9**	9.3*

Significance levels: \*\*p&lt;.001, \*p&lt;.01

<sup>†</sup> Includes daughter in law and son in law**Nutritional problems and interventions**

Specific nutritional and dietary problems of elderly refugees observed were:

1. Chewing whole grain maize.
2. Queuing for food, mill, water.
3. Collecting firewood, water.
4. Obtaining additional food to complement the general ration.
5. 'Psychological malnourishment' i.e. not eating the food that elderly feel they need.

Although people seem to have arrived in relatively good nutritional and health status, their condition deteriorated rapidly in the camps. Facilities got overwhelmed resulting in outbreaks of diseases such as dysentery. Initially mortality rates of 10/10,000/day occurred which is 33 times the normal rate, although the prevalence of wasting was around 10% which is not high (Hakewill, 1991; UN ACC/SCN, 1994). According to reports of medical organisations, the nutritional status, mortality and morbidity of adults were worst during the first six months after arrival. It improved considerably once the refugees were settled and had found ways to supplement their diet. Child malnutrition rates were low from 1995 onwards and the average birth weight was quite high (see annex 6.7). Medical workers also had the impression that malnutrition among adults was not a major problem and believed that most cases were primarily medical or social.

Nevertheless Memisa ran an adult feeding centre in Chabalisa I. The admission criteria were BMI < 16 and/or severe medical conditions such as tuberculosis. The centre was closed in January 1996 as attendance data indicated that there was no longer a need. Since then, only dry rations<sup>12</sup> were administered on a weekly basis to adults in both camps by home visitors who were also responsible for addressing social problems. Older adults were visited by HAI's homevisitors who collected the rations from Memisa. There were indications that the nutritional status of adults was again deteriorating after reducing the over-registration and hence over-distribution in December 1995.

---

<sup>12</sup> The supplementary dry ration amounted to 160 g/person/day and included: 30 g dry skimmed milk, 80 g CSB, 30 ml oil and 20 g sugar.

## 7. Quantitative results

### 7.1 Anthropometric characteristics

The distributions of the anthropometric and derived variables were fairly normal for both sexes except for the skinfolds. These were slightly positively skewed and some positive kurtosis could be observed. A logarithmic transformation improved the skinfold distributions so that they could be used for parametric tests.

In the sample, 5.0% was recorded as having some degree of kyphosis. There was no difference between the sexes but kyphosis was significantly more prevalent in the oldest age group. For non-kyphotic people the body mass index (BMI) was calculated in the ordinary way using height and weight ( $\text{weight (kg)} / \text{height}^2 \text{ (m)}$ ). However height could not be measured in people with kyphosis or bent legs. For this group, regression equations were used to estimate height from armspan. Hence BMI figures presented for the whole sample were calculated using measured height for the majority, and using height estimated from armspan for people for whom no reliable height measurement was available. Paragraph 7.1.3 deals with this in greater detail.

#### 7.1.1 Comparison between sexes

Table 7.1 presents the details of the anthropometric variables and derivations. Men showed higher means than women for weight, height, the long bone measurements, calf circumference and arm muscle area (AMA). Women exceeded men for BMI, mid-upper arm circumference (MUAC), skinfolds, total upper-arm area (TUA), corrected upper-arm muscle area (CAMA), upper-arm fat area (AFA) and arm fat index (AFI)). T-tests showed significant differences between men and women for all anthropometric variables except for CAMA. This indicates that men were generally of bigger size and leaner than women, although men did not have significantly more arm muscle tissue than women. Correlation coefficients between BMI and height were low ( $-0.07$  for men (n.s.),  $-0.15$  ( $P < 0.01$ ) for women), indicating that BMI can be considered to be independent of height in this population. Interestingly, armspan significantly exceeded height in men by an average of  $12.4 \text{ cm} \pm 4.3 \text{ cm}$  ( $t=56.39$ ,  $P < 0.001$ ) and in women by an average of  $8.7 \text{ cm} \pm 4.1 \text{ cm}$  ( $t=41.87$ ,  $P < 0.001$ ).

Table 7.1 Anthropometric characteristics of men and women

	Sex	Mean	SD	Range	n	t-value <sup>†</sup>
Weight (kg)	m	55.8	6.9	37.5 - 81.6	412	6.7*
	f	52.5	7.6	35.6 - 79.6	414	
Height (cm)	m	166.1	6.6	144.1 - 182.3	389	20.2*
	f	156.9	6.1	140.4 - 178.4	394	
Armspan (cm)	m	178.7	7.8	160.5 - 199.8	396	24.2*
	f	165.6	7.5	145.5 - 201.0	404	
Halfspan (cm)	m	89.4	4.1	76.3 - 101.0	412	22.5*
	f	83.2	3.8	73.0 - 100.8	409	
Demispan (cm)	m	81.4	3.8	69.3 - 91.8	412	21.6*
	f	75.8	3.6	64.0 - 90.5	409	
MUAC (cm)	m	25.1	1.9	18.8 - 32.0	413	-6.0*
	f	26.1	2.8	18.0 - 39.2	415	
Triceps (mm)	m	5.9	1.7	3.1 - 14.4	413	-30.0*
	f	11.8	4.2	4.1 - 31.7	415	
Biceps (mm)	m	3.1	0.7	1.9 - 7.1	413	-22.0*
	f	5.2	2.3	2.1 - 15.9	415	
Sub-scapular (mm)	m	9.3	2.4	4.4 - 20.1	412	-14.7*
	f	13.1	4.8	5.1 - 36.9	414	
Kneeheight (cm)	m	52.6	2.7	45.0 - 60.5	413	18.8*
	f	49.1	2.5	43.2 - 59.6	410	
Calf circumference (cm)	m	32.7	2.5	25.7 - 44.4	413	6.1*
	f	31.6	2.8	23.8 - 40.7	413	
BMI (kg/m <sup>2</sup> ) <sup>‡</sup>	m	20.2	2.0	14.6 - 28.1	411	-6.5*
	f	21.3	2.9	13.6 - 35.6	411	
TUA (cm <sup>2</sup> )	m	50.4	7.8	28.1 - 81.5	413	-6.3*
	f	54.8	12.2	25.6 - 122.3	415	
AMA (cm <sup>2</sup> )	m	43.2	6.3	24.8 - 63.8	413	6.1*
	f	40.2	7.5	22.1 - 70.4	415	
CAMA (cm <sup>2</sup> )	m	33.2	6.3	14.8 - 53.8	413	-1.2
	f	33.7	7.5	15.6 - 64.9	415	
AFA (cm <sup>2</sup> )	m	7.2	2.4	3.2 - 21.4	413	-25.8*
	f	14.6	6.4	3.6 - 51.3	415	
AFI (%)	m	14.2	3.5	8.1 - 26.3	413	-33.9*
	f	25.8	6.8	11.0 - 49.2	415	

Significance level for difference between sexes \*  $P < 0.001$ <sup>†</sup> t- and p-values for skinfolds, AFA and AFI refer to tests applied to log 10 transformed variables<sup>‡</sup> Body Mass index, calculated using height estimated from armspan for kyphotic people

## 7.1.2 Comparison between age groups

Table 7.2 and 7.3 show the results of a comparison between the age groups <60, 60-69 and ≥70 years for men and women respectively (ANOVA test). Differences between age groups in both sexes were found for the variables weight, height, armspan, halfspan, demispan, MUAC, calf circumference, TUA, AMA and CAMA. No difference between age groups in either sex was found for BMI, biceps and subscapular skinfold and AFA. In addition, differences between age groups were found for triceps and AFI only in men and for kneeheight in women. Significantly lower values for long bone measurements in older age groups were not anticipated, but could have been due to a secular trend. Significant differences mostly occurred between the youngest age group and the two others. Directions were inverse with age, indicating a pattern of lower anthropometric values in older age groups. Exceptions were triceps and AFI that were significantly higher in men of more advanced age.

Table 7.2 Anthropometric variables compared between age groups in men

Men (n=413)	<60 years		60-69 years		≥70 years	
	mean	SD	mean	SD	mean	SD
Weight (kg)	57.2	6.8	55.0*	6.8	54.1*	6.6
Height (cm)	167.2	6.4	165.7	6.5	163.9*	7.0
Armspan (cm)	179.8	7.9	178.3	7.7	176.8*	7.6
Halfspan (cm)	90.1	3.9	89.1*	4.2	88.3*	4.1
Demispan (cm)	82.1	3.6	81.0*	4.0	80.5*	3.9
MUAC (cm)	25.5	1.8	24.9*	1.9	24.6*	2.1
Triceps (mm)	5.7	1.8	6.0	1.6	6.3*	1.9
Biceps (mm)	3.1	0.7	3.1	0.7	3.1	0.7
Subscapular (mm)	9.2	2.3	9.3	2.4	9.3	2.7
Kneeheight (cm)	52.7	2.6	52.5	2.8	52.1	2.4
Calf circumference (cm)	33.1	2.4	32.4*	2.5	32.1*	2.6
BMI (kg/m <sup>2</sup> )	20.4	1.9	20.0	2.1	20.1	2.1
TUA (cm <sup>2</sup> )	51.8	7.5	49.5*	7.6	48.4*	8.1
AMA (cm <sup>2</sup> )	44.7	6.0	42.3*	6.2	40.9*	6.4
CAMA (cm <sup>2</sup> )	34.7	6.0	32.3*	6.2	30.9*	6.4
AFA (cm <sup>2</sup> )	7.1	2.5	7.2	2.2	7.5	2.7
AFI (%)	13.5	3.4	14.4*	3.2	15.3*	3.8

\* Mean values were significantly different from those for <60 years, ANOVA test,  $p < 0.05$

Table 7.3 Anthropometric variables compared between age groups in women

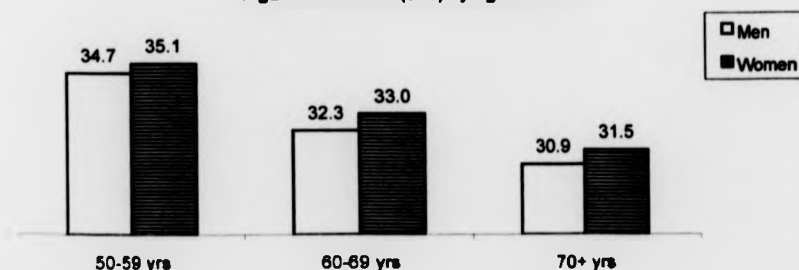
Women (n=415)	<60 years		60-69 years		≥70 years	
	mean	SD	mean	SD	mean	SD
Weight (kg)	54.4	8.1	51.2*‡	6.6	49.9*‡	6.6
Height (cm)	158.4	6.2	156.1*	5.6	154.3*	5.9
Armspan (cm)	166.7	7.4	165.5	7.5	162.5*†	7.3
Halfspan (cm)	83.9	3.7	83.2	3.8	81.4*†	3.8
Demispan (cm)	76.4	3.6	75.7	3.4	74.3*†	3.6
MUAC (cm)	26.6	3.0	25.8*	2.6	25.3*	2.6
Triceps (mm)	12.2	4.4	11.6	4.0	11.3	4.0
Biceps (mm)	5.6	2.5	5.0	2.0	4.9	2.2
Sub-scapular (mm)	13.5	5.2	12.8	4.5	12.3	4.4
Kneeheight (cm)	49.5	2.7	49.1	2.3	48.4*	2.4
Calf circumference (cm)	32.6	2.8	30.9*	2.6	30.2*	2.5
BMI (kg/m <sup>2</sup> )	21.7	3.1	21.0	2.6	21.2	2.7
TUA (cm <sup>2</sup> )	57.0	13.3	53.6*	10.9	51.5*	10.8
AMA (cm <sup>2</sup> )	41.6	7.8	39.5*	7.1	38.0*	6.7
CAMA (cm <sup>2</sup> )	35.1	7.8	33.0*	7.1	31.5*	6.7
AFA (cm <sup>2</sup> )	15.4	7.0	14.1	5.8	13.5	5.6
AFI (%)	26.1	6.6	25.7	6.9	25.5	6.9

\* Mean values were significantly different from those for <60 years, ANOVA test,  $P < 0.05$

† Mean values were significantly different from those for 60-69 years, ANOVA test,  $P < 0.05$

‡ Kruskal-Wallis test to detect different group means, Mann-Whitney test to identify the groups

Muscle tissue is important in relation to the ability to carry out activities and remain independent and fat stores serve as an energy reserve. The tables show that AFA is not different between age groups, but CAMA (and AMA) is significantly lower in the older age groups which is illustrated in figure 7.1.

Figure 7.1 CAMA (cm<sup>2</sup>) by age and sex



### 7.1.3 Derivation of BMI

BMI is the most widely used index of nutritional status. As mentioned earlier, the calculation of BMI using height is problematic in the elderly. The fact that BMI cannot be calculated for people with kyphosis means that substantial proportions of older populations remain excluded from nutritional status assessments. In Caucasian populations the armspan-height ratio has been found to be nearly 1 at maturity (Allen, 1989; Reeves et al, 1996). Although armspan significantly exceeded height in this sample, out of curiosity, armspan measurements were first used to replace height in the BMI equation with no correction. Similarly halfspan multiplied by two was used directly in the BMI equation. For kneeheight a regression equation was used developed from a black and a white American sample (Chumlea et al, 1998). Figures calculated from equations for non-Hispanic black and non-Hispanic white people are presented to illustrate ethnic differences. Table 7.4 shows the percentages of men and women being classified as underweight (defined as  $BMI < 18.5 \text{ kg/m}^2$ ) using various alternative measurements as suggested in the literature. This analysis was conducted only on those individuals for whom both height and all long bone measurements were available. It is obvious that just substituting height by one of the alternatives is not very helpful: the prevalence of undernutrition seems grossly over-estimated. BMI-kneeheight using the black Americans' equation comes closest to the BMI-height prevalence of undernutrition. These results reveal the existence of substantial ethnic differences in height ratios to long bone.

Table 7.4 Prevalences of undernutrition by sex based on BMI using alternatives to height (n=757)

	BMI < 18.5 kg/m <sup>2</sup>	
	% men	% women
BMI-height	17.4	12.8
BMI-armspan	73.5	45.3
BMI-halfspan	76.1	48.7
BMI-kneeheight from black Americans' equations	26.5	15.4
BMI-kneeheight from white Americans' equations	42.1	21.4

Hence another strategy was adopted: estimating height from long bone measurements. Sex-specific regression equations were obtained for height versus each alternative measurement, using the non-kyphotic group. As this does not account for invisible height loss due to spinal compression and since 'the older old' may have shrunk more than 'the younger old', age was also entered into the equations. However, age was not significant in equations with arm measurements in men. The equations are given in table 7.5.

Table 7.5 Sex-specific regression equations for height versus each alternative measurement in the non-kyphotic group

MEN						r	R <sup>2</sup>	SE	n
height (cm) =	42.34	+ 0.69	armspan			0.84	0.71	3.52	373
height (cm) =	44.95	+ 1.36	halfspan			0.84	0.70	3.64	388
height (cm) =	51.79	+ 1.41	demispan			0.82	0.67	3.84	388
height (cm) =	62.61	+ 2.07	kneeheight	- 0.09	age	0.86	0.74	3.37	389
WOMEN						r	R <sup>2</sup>	SE	n
height (cm) =	49.55	+ 0.68	armspan	- 0.08	age	0.84	0.70	3.36	387
height (cm) =	50.26	+ 1.33	halfspan	- 0.07	age	0.83	0.69	3.37	391
height (cm) =	56.44	+ 1.39	demispan	- 0.08	age	0.82	0.67	3.52	391
height (cm) =	63.27	+ 2.03	kneeheight	- 0.10	age	0.84	0.71	3.29	391

Armspan and kneeheight gave high correlations with height in both sexes and low standard errors. In women, correlation coefficients of height with both kneeheight and armspan were 0.84 and with halfspan 0.83. In men kneeheight had a slightly higher correlation with height ( $r=0.86$ ) than armspan and halfspan ( $r=0.84$ ). As the differences were very minor, practical aspects were also taken into consideration. Arm measurements are easier, quicker and more acceptable to subjects than kneeheight. Therefore the best arm measurement - armspan - was chosen to proceed with in further calculations. Hence height was estimated from armspan (and age in women) for the kyphotic group, using the regression equations. Next, BMI was calculated using the estimated heights. Thus BMI was calculated either using measured height or height estimated from armspan, depending on the availability of the height measurement.

### 7.1.4 Indicators of undernutrition

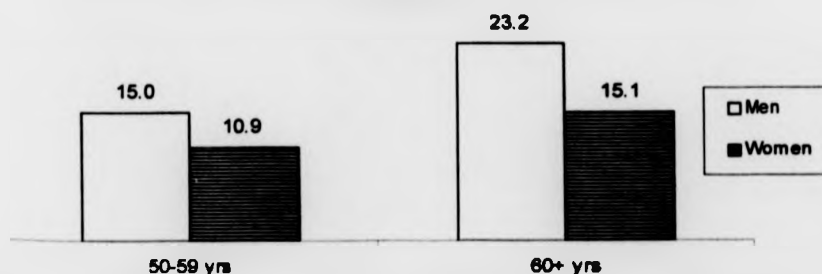
With BMI figures available for nearly the entire sample ( $n=822$ ), evaluation of the nutritional status of the population provides a more complete picture. Defining underweight as  $\text{BMI} < 18.5 \text{ kg/m}^2$  according to Shetty & James (1994), 19.5% of the men and 13.1% of the women were found to be underweight and these proportions were significantly different ( $\chi^2 = 6.0$ ,  $P < 0.05$ ). Only a small number was severely underweight ( $\text{BMI} < 16$ ); however a considerable proportion of women was overweight (table 7.6). Overweight in women occurred more in the youngest age group: of the women aged 50-59 years 13.5% was overweight compared with 8.4% of those aged 60-69 years and 7.8% of those  $\geq 70$  years.

Table 7.6 Distribution of BMI

BMI categories ( $\text{kg/m}^2$ )	% men ( $n=411$ )	% women ( $n=411$ )
< 16	1.0	0.7
16 - 17	2.7	3.6
17 - 18.5	15.8	8.8
18.5 - 25	78.8	76.2
> 25	1.7	10.7

BMI had a weak negative correlation with age that was only significant in women ( $r = -0.048$  for men,  $r = -0.1$  ( $P < 0.05$ ) for women). Figure 7.2 illustrates that the proportion undernourished was higher in older people, although not significantly in women ( $\chi^2 = 4.4$  for men,  $P < 0.05$ ).

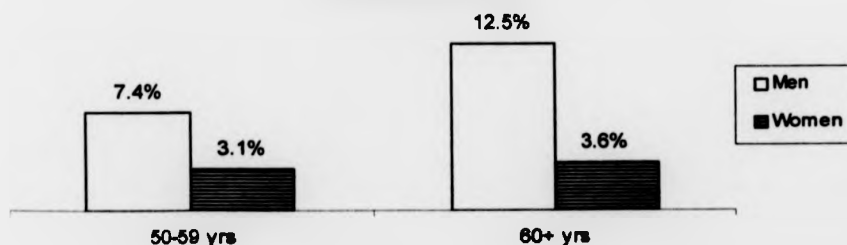
Figure 7.2 Percentage undernourished ( $\text{BMI} < 18.5 \text{ kg/m}^2$ ) by age and sex



Comparing kyphotic with non-kyphotic people, there was a significant difference in mean BMI in both sexes ( $P < 0.001$ ). The BMI values were  $19.4 \text{ kg/m}^2$  for kyphotic men, versus  $20.3 \text{ kg/m}^2$  for non-kyphotic men and the values for women were  $19.5 \text{ kg/m}^2$  and  $21.4 \text{ kg/m}^2$  respectively. Considering the prevalence of undernutrition, a  $\text{BMI} < 18.5 \text{ kg/m}^2$  was found in 45.5% of the kyphotic men and in 18.0% of the non-kyphotic men. In women the proportions were 28.6% and 12.6% respectively. This may partly be due to a higher mean age in the group with kyphosis (69.5 versus 60.5 years), however this cannot explain the large differences as the prevalence of undernutrition in the non-kyphotic group aged 70 years and older was lower than in the entire kyphotic group: 20.0% for men and 9.1% for women.

MUAC is an indicator of undernutrition that can be obtained quickly and with few resources. Using the cut-off points of 23 cm for men and 22 cm for women as proposed by James et al (1994), 10.2% of the men and 3.4% of the women were undernourished. Figure 7.3 illustrates that the proportion undernourished was higher in older people, especially in men, but did not reach significance in either sex.

Figure 7.3 Percentage with low MUAC (men  $< 23 \text{ cm}$ , women  $< 22 \text{ cm}$ ) by age and sex



Applying the cut-offs to MUACs of people with kyphosis, 20.8% of the kyphotic men had a low MUAC compared with 9.5% in the non-kyphotic group. In women the proportions were 5.9% in the kyphotic group compared with 3.3% in the non-kyphotic group.

Further, the ability of MUAC measurements to predict poor nutritional status in this population was examined. For this purpose the regression equation of MUAC against

BMI was computed from which MUAC cut-offs corresponding to conventional BMI cut-offs were derived. As MUAC cut-offs were almost the same for men and women, the sexes were combined. MUAC values of 23.7, 22.5 and 21.7 cm corresponded with BMI cut-offs of 18.5, 17 and 16 kg/m<sup>2</sup> respectively. Thereafter the sensitivity (proportion of true positives that are correctly classified) and specificity (proportion of true negatives that are correctly classified) of MUAC measurements was determined. Table 7.7 shows that sensitivity is highest at low BMIs and that specificity exceeds sensitivity. Annex 7.1 provides the regression equation and data from which sensitivity and specificity were calculated.

Table 7.7 Sensitivity and specificity of MUAC measurements in predicting poor nutritional status as measured by BMI

	Sensitivity	Specificity
BMI 18.5 kg/m <sup>2</sup> and MUAC 23.7 cm	70.9%	89.4%
BMI 17 kg/m <sup>2</sup> and MUAC 22.5 cm	60.6%	94.8%
BMI 16 kg/m <sup>2</sup> and MUAC 21.7 cm	85.7%	97.9%

BMI and MUAC do not agree very well in the middle BMI category, implying that MUAC would be a poor substitute for BMI in this category. However MUAC is most sensitive in the lowest BMI category, those with BMI < 16 kg/m<sup>2</sup>, and may therefore be adequate to identify the severely undernourished. The severely undernourished would actually be the group of interest in the acute phase of an emergency for example with a view to providing therapeutic feeding.

Although the MUAC cut-off corresponding to BMI 16 kg/m<sup>2</sup> does have the highest sensitivity, it must be treated with caution as it was derived from a very small group. Nevertheless, an analysis carried out with the combined Rwandan and Malawi (Chilima, 1998) data sets which included more people with BMI < 16 kg/m<sup>2</sup>, confirmed the rounded off cut-off value of 22 cm (Ismail & Manandhar, 1999).

## 7.2 Physical tests

The distributions of the object recall test and the handgrip test were fairly normal for both sexes. However, the timed test distributions were positively skewed and showed positive kurtosis. Sex-specific 25- and 75-percentiles (for the handgrip and timed test respectively) were calculated in order to group the sample into poor performers and good performers. This was done for two reasons. Firstly the timed tests were not normally distributed and secondly people who did not complete a test had to be included otherwise the worst performers would be missed out.

### 7.2.1 Comparison between sexes

The means, standard deviations and ranges in table 7.8 show that men had lower mean values for the timed tests (faster performance) than women and a higher mean for the handgrip test. The mean values for the object recall test were the same. T-tests for handgrip strength and the object recall test revealed that mean values for handgrip strength were significantly different between the sexes ( $t=19.5$ ,  $P<0.001$ ). This was not entirely explained by body size, as women had significantly lower strength per kg body weight ( $t=16.47$ ,  $P<0.001$ ).

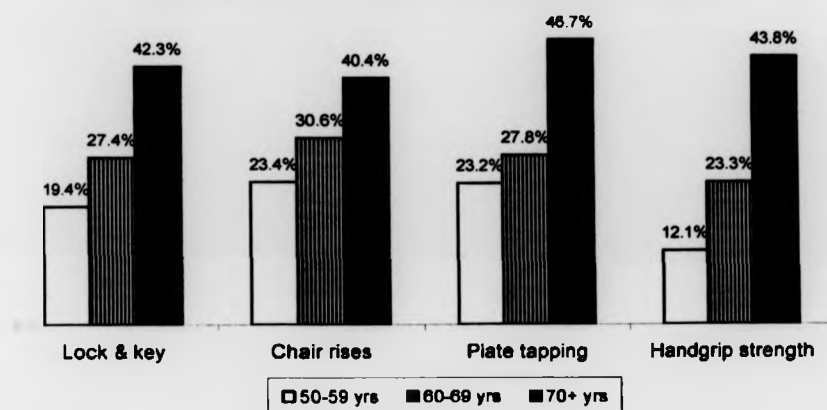
Table 7.8 Means of physical tests in men and women

Test	Sex	n	Mean	SD	Range
Handgrip strength (kg)	m	413	30.3	6.7	8.0 - 52.0
	f	409	22.3	5.1	9.0 - 36.0
Object recall	m	410	7	1.8	3 - 12
	f	412	7	2.0	1 - 13
Lock & key (sec)	m	410	8.4	5.5	2.2 - 54.6
	f	410	10.1	7.6	2.7 - 73.7
Chair rises (sec)	m	396	14.7	6.4	4.5 - 52.0
	f	387	15.7	7.0	6.0 - 59.2
Plate tapping (sec)	m	396	28.7	10.6	15.5 - 111.1
	f	389	30.9	10.3	17.0 - 93.2

### 7.2.2 Comparison between age groups

Using the sex specific percentile cut-offs, people in the worst performing 25<sup>th</sup> percentile were compared according to age. From figure 7.4 it can be seen that poor performance is significantly over-represented in the oldest age group for all tests ( $P < 0.001$ ). Thus physical test performance was clearly better in younger age groups.

Figure 7.4 Age distribution in worst performing percentile



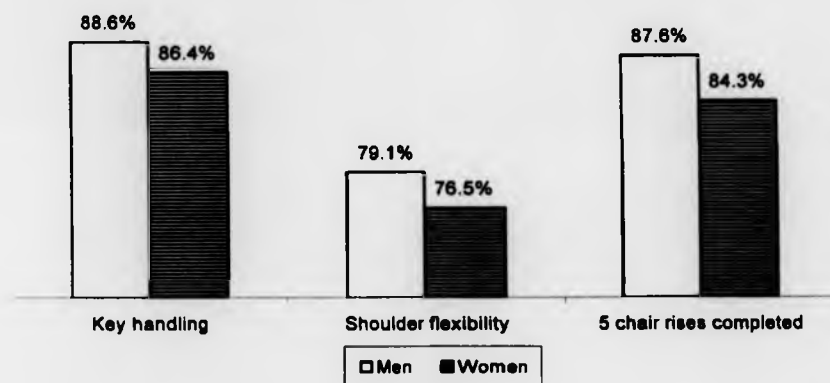
The prevalence of impaired<sup>1</sup> handgrip was also significantly higher among people with kyphosis than among those without: 45.8% versus 23.4% in men ( $P < 0.05$ ) and 52.9% versus 17.0% in women ( $P < 0.001$ ) respectively. These figures may be confounded by age; however in non-kyphotic women aged 70 years and older, a lower percentage was found with impaired handgrip strength than in kyphotic women: 36.4%. In men no such difference could be demonstrated.

<sup>1</sup> Although this is an arbitrary cut-off, it does not assume any particular distribution and it is population-referenced rather than based on any criteria. Non-performers were recoded as 'impaired'.

### 7.2.3 Scored physical tests

Performance in those physical tests that were recorded as a score was generally very high. Figure 7.5 shows the proportions that were able to perform without problems. As the category 'unable' hardly included subjects, it was merged with the category 'partially able' for analysis. No significant differences were found between the sexes. However cross-tabulations consistently showed significant over-representation of the  $\geq 70$  years age group in the impaired group ( $P < 0.01$ ). For women this was not significant for shoulder flexibility.

Figure 7.5 Performance without problems in scored physical tests



## 7.3 Activities of Daily Living

Bathing was not included in the analysis as there is a cultural habit amongst people in rural east Rwanda to have one's back washed and this would give unrealistically high dependence levels. Continence gave extraordinary high dependency levels in both sexes. There may have been some misunderstanding with this question or it may relate to the fact that latrine facilities were often at considerable distance from the blende and shared between several households. Moreover bladder and bowel control refer to different dimensions than those assessed by other ADLs. Although continence is included in the original ADL-scale, some population studies did not include it as it has many forms and



may be present in persons who are otherwise healthy (Guralnik & Lacroix, 1992). In this study continence was also excluded from further analysis.

Table 7.9 shows summarised data on dependence in ADLs, measured as any assistance required, however minor, to perform the given activity. In general dependency levels were very low and women were slightly more dependent than men. Older people were more likely to be dependent in transferring ( $P<0.001$ ). Due to small numbers, statistical tests could not be done for other ADLs. Independent in all ADLs (eating, transferring, dressing, toileting) were 92.5% of the men and 90.4% of the women.

Table 7.9 Proportions dependent in activities of daily living (%)

Activity	Sex	50-59 years	60-69 years	≥70 years	Total
Eating	m	1.6	0.7	1.4	1.2
	f	1.0	3.2	4.5	2.4
Transferring	m	3.7	2.6	19.7	6.1
	f	2.6	6.4	19.7	6.7
Dressing	m	2.6	2.6	7.0	3.4
	f	2.1	2.5	4.5	2.7
Toileting	m	3.7	2.6	2.8	3.1
	f	3.6	4.5	9.1	4.8

Dependency proportions in various dimensions of mobility are displayed in table 7.10. Walking 1 km and walking uphill were assessed by self-report, while mobility was reported by two observers<sup>2</sup>. Like bathing, travelling proved to be a less appropriate question in this context as most refugees do not travel and are officially not even supposed to do so. Thus this question was ignored. Four people were housebound, all of them women without oedema. Two of them were below 60 years of age and two above.

For both sexes, the lowest dependency prevalence occurred for walking 1 km and the highest for observed mobility. Comparing the sexes and age groups, higher proportions of women ( $P<0.05$ ) and older people ( $P<0.001$ ) were dependent.

<sup>2</sup> In the mobility variable used in the analysis, subjects were coded as 'impaired' when recorded as such by either one of the observers or by both.

Table 7.10 Proportions dependent in mobility (%)

Dimension	Sex	50-59 years	60-69 years	≥70 years	Total
Walking 1 km	m	4.4	3.4	11.3	5.1
	f	4.2	7.0	26.6	8.7
Walking uphill	m	5.3	9.8	25.4	10.4
	f	9.4	16.6	36.7	15.9
Mobility (observed)	m	9.5	19.1	48.6	19.7
	f	13.0	28.0	57.6	25.8

#### 7.4 Nutritional status and functional ability indicators

In order to examine the determinants of nutritional vulnerability in this refugee population, nutritional status indicators and functional ability indicators were selected and examined in relation to each other and to socio-economic and morbidity variables. Bivariate analyses were performed first, leading to a model of nutritional vulnerability which was then examined through multiple regression analysis.

##### 7.4.1 Associations between nutritional status and functional ability variables

Using BMI as nutritional status indicator, associations with functional ability variables were examined. For this purpose, dichotomous functional ability variables were created defining impairment for continuous variables as being in the lowest 25<sup>th</sup> percentile (including those who did not complete the test) and for the scored variables as being partially or completely dependent.

None of the ADLs, nor mobility or shoulder flexibility<sup>3</sup>, were significantly associated with low BMI (<18.5 kg/m<sup>2</sup>). For the ADLs this was partly due to the fact that small numbers often invalidated cross-tabulation (here the small range in functional ability in the population is a constraint for the analysis). Considering cross-tabulations for the other physical tests (annex 7.2), handgrip showed the strongest relationship with nutritional status. Being impaired in handgrip was significantly associated with low BMI in the whole group and in men. Impaired chair stands was only significantly associated with low BMI in women. Surprisingly, significant associations were found in the whole

<sup>3</sup> A combination of internal and external shoulder flexibility.

group between adequate BMI and poor performance in plate tapping and the lock & key test.

Thereafter correlation coefficients were computed between handgrip strength (excluding those who had not completed the test) and various anthropometric variables by sex and age (table 7.11). The highest correlations were found with indicators of muscle mass (AMA, calf circumference and to a lesser extent MUAC) and they were higher in men than in women.

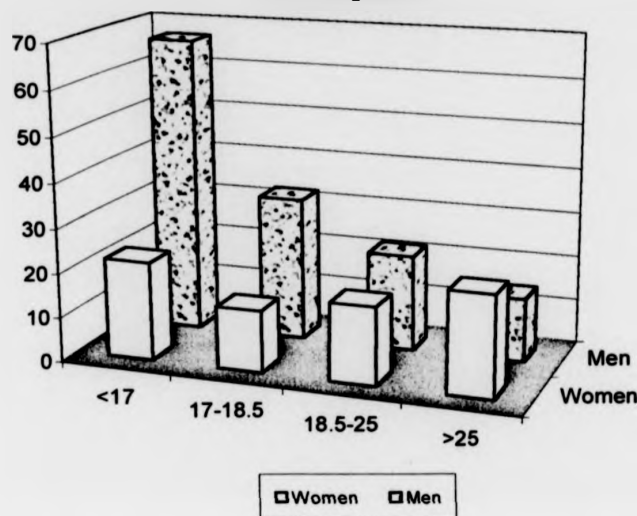
Table 7.11 Significant correlation coefficients ( $P < 0.05$ ) between handgrip strength and anthropometric variables by sex and age.

Handgrip strength correlated with:	Men		Women	
	< 60 years	≥ 60 years	< 60 years	≥ 60 years
BMI	.18*	.29*	-	.16*
MUAC	.34*	.34*	.18	.19
Calf circumference	.28*	.32*	.22	.27*
AMA	.38*	.34*	.18	.23*
AFA	-	.20	-	.14

\* Also significantly lower mean ( $P < 0.05$ ) for the anthropometric variable in the impaired group versus the unimpaired group for handgrip strength.

The weaker correlation between BMI and handgrip strength in women than in men is remarkable. However comparing proportions with impaired handgrip strength across BMI categories revealed that in overweight women the proportion with impaired handgrip was as high as in those with BMI < 17. Figure 7.6 illustrates the non-linear relationship in women.

Figure 7.6 Proportions with impaired handgrip strength across BMI categories



To determine to which extent impairment in handgrip strength implied impairment in the other tests, correlations between handgrip strength and each of the other tests were computed. Table 7.12 shows that all correlations were significant ( $P < 0.01$ ).

Table 7.12 Correlations<sup>†</sup> between handgrip strength and other tests

r	Lock & key	Chair rises	Plate tapping
Men	-.20*	-.34*	-.29*
Women	-.22*	-.31*	-.34*

<sup>†</sup> Correlation between continuous variables (transformed for timed tests).  
Significance level: \* $P < 0.01$

Considering the correlations between handgrip strength and the other tests and the strong relationship of handgrip strength with nutritional status, results are presented using handgrip strength as the functional ability indicator in further bivariate analysis. However we need to remember that handgrip strength measures only one dimension of functional ability.

The relative risk of impaired handgrip in individuals with poor nutritional status compared with those of adequate nutritional status was estimated using the odds ratio. Excluding the group with a BMI > 25 kg/m<sup>2</sup>, the odds ratio for the whole group was 1.75 (95% confidence interval: 1.15-2.66), indicating that individuals with poor nutritional status have an almost double risk of impaired handgrip compared to those with adequate nutritional status. Odds ratios for other tests were not significant for chair stands (1.34) or indicated a lower risk: 0.68 for the plate tapping test (not significant) and 0.61 for the lock & key test (95% confidence interval: 0.38-0.97).

#### **7.4.2 Associations with socio-economic and health variables**

Selected socio-economic and health variables were tested for associations with BMI and handgrip strength. Table 7.13 lists proportions per variable that showed significant associations ( $p < 0.05$ ) with low BMI (<18.5 kg/m<sup>2</sup>) and impaired handgrip strength (lowest 25<sup>th</sup> percentile). Many variables seem to be more associated to functional ability than to nutritional status. This may be because there was basic access to food in the camp which gave impaired people the option to stay at home, whereas in normal poor communities people must work to obtain food and their nutritional status will probably further deteriorate.

Table 7.13 Prevalence of low BMI and impaired handgrip strength in relation to responses to socio-economic and health questions

MEN AND WOMEN	% with BMI < 18.5		% with impaired handgrip	
	yes	no	yes	no
<b>Food security</b>				
has a kitchen garden?	ns	ns	20	47 **
cultivates other land?	ns	ns	15	23 *
eats enough?	13	18 *	14	27 **
<3 meals per day?	18	13	25	17 **
prepares own food?	ns	ns	25	19 *
<b>Income/health</b>				
can afford to offer drink?	ns	ns	15	26 **
drinks alcohol?	ns	ns	18	28 **
<b>Activities</b>				
does gardening?	ns	ns	17	33 **
engaged in paid labour?	10	19 **	12	26 **
<b>(Family) support</b>				
shares feelings with people?	ns	ns	17	31 *†
<b>Social network</b>				
is consulted?	ns	ns	16	39 **†
<b>Health</b>				
poor vision?	ns	ns	33	18 **
difficulty chewing?	ns	ns	30	14 **
not eating some foods?	ns	ns	31	17 **
prolonged coughing?	ns	ns	27	20 *
arthritis?	ns	ns	31	21 *

Significance levels: \*\* $p < .001$ , \* $p < .05$ , ns: not significant

† Only for women

### 7.5 Nutritional vulnerability

Nutritional vulnerability cannot be explained by one single factor. Indeed, significant associations between various determinant factors and impaired nutritional status and functional ability were demonstrated in the previous section. Prior analyses have shown

that nutritional status and functional ability are also related and that both are related to sex and age. In contrast to bivariate analysis, multiple regression allows for the identification of the net effect of variables, while controlling for other determining factors.

### **7.5.1 A hierarchical model of determinants**

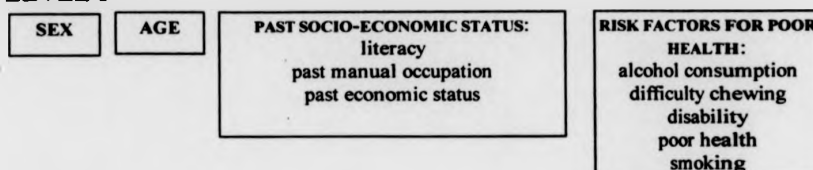
Different analytical strategies can be followed in multiple regression: the statistical and hierarchical strategy. The statistical strategy relies heavily on statistical criteria for the selection of the optimum explanatory model, without taking into account the theoretical model on which the research is based. In other words, all explanatory variables are considered to have the same importance.

Hierarchical regression modelling is more selective since it requires that the selection of the explanatory variables is not entirely based on statistical criteria, but also on a theoretical model that describes the logical or theoretical relationships between the determinant factors. The variables that are presumed to be of greater explanatory importance, should be given higher priority in the model.

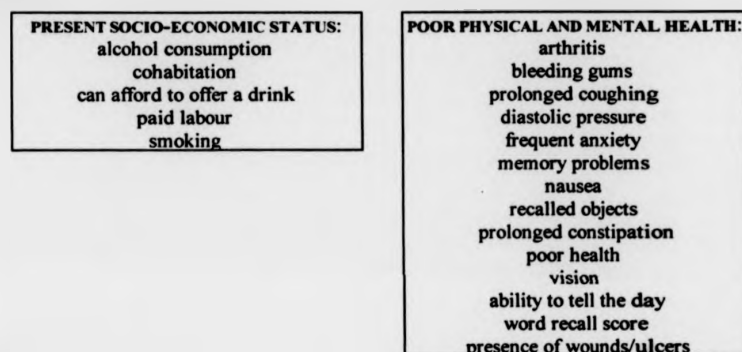
In this context, a simplified hierarchical model (figure 7.7) was developed based on the framework of interrelations presented in chapter 4. It is assumed that factors in the highest hierarchical level (level 1) have the highest priority as they influence nutritional vulnerability through a set of other risk factors. The model reflects a hierarchy, nevertheless there will also be relationships within and between levels that are not adjacent. The model does not pretend to be the single and correct one: there are various pathways one could follow in arguing what factors determine nutritional vulnerability and in what hierarchy.

Figure 7.7 Hierarchical model for nutritional vulnerability

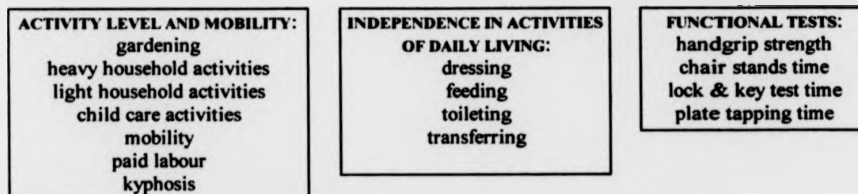
## LEVEL 1



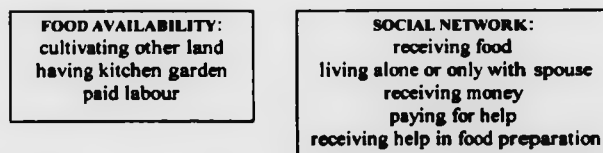
## LEVEL 2



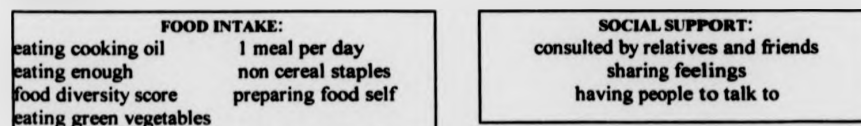
## LEVEL 3



## LEVEL 4



## LEVEL 5



NUTRITIONAL  
STATUS



The reasoning behind the model can be described as follows. Many studies have shown that socio-economic status is an important determinant factor of nutritional status. People of low socio-economic status, due to their low purchasing and productive power, are less likely to meet their nutritional needs. Moreover it is realistic to take the history into consideration as those who had a high socio-economic status in Rwanda, presumably arrived in the camp in a better physical condition and with more assets and therefore were more likely to achieve a relatively high socio-economic status as a refugee. Available indicators for *past socio-economic status* are past economic status (derived from past occupation), educational status (literacy) and whether people were manual labourers (measure of muscularity and income, also derived from past occupation). Moreover there are *risk factors for poor health* (smoking, alcohol consumption, chewing problems, disability and self-reported poor health<sup>4</sup>) that represent historical factors that may predispose to an impaired nutritional and functional status. These sets of variables together with the overruling factors *sex* and *age* are considered to be preceding factors. Presumably they affect nutritional status through factors in lower levels and are therefore placed in the highest level.

Taking into consideration the conditions during the acute emergency phase and that the refugees had been in the camp for more than a year, current nutritional status can only be partly explained by the past status. The second level refers to the present status and logically includes *present socio-economic status*, assessed by cohabitation, ability to afford to offer a drink to guests, doing paid labour, smoking and alcohol consumption. The latter two are also *risk factors for poor health* as they were considered to be indicators of health as well as of socio-economic status in this population. Further *poor physical and mental health* reflecting current health status, comes in level 2. It includes a range of health related variables: blood pressure, vision, arthritis, nausea, bleeding gums, wounds, prolonged coughing and constipation (both for more than a week), self reported health, frequent anxiety and cognitive status<sup>5</sup>.

---

<sup>4</sup> As health was probably interpreted in wider terms than just physical health, this variable may comprise various components.

<sup>5</sup> Assessed by frequent memory problems (self-report), ability to tell the day and performance in the object and word memory test.

After past and current socio-economic and health status, three sets of variables expected to influence nutritional status next, were placed in level 3: *independence in activities of daily living, performance in the functional tests and activity level and mobility*. The latter was assessed by various activities (in the household, gardening and child care), mobility, doing paid labour (an indicator of both economic status and of activity level) and kyphosis which may be an impediment to mobility and affect one's activity level. The sets of variables are highly interrelated since the functional tests<sup>6</sup> are indicators of the ability to perform certain activities.

Physical function and mobility have an impact on the productive capacity and therefore on food production (in kitchen garden, on other land or through labour) and *food availability*. Physical function and mobility are also likely to influence *social network* through social isolation, social status and receiving support. This was assessed by living arrangements (living alone/with elderly spouse only, or with younger adults), receiving food and money (as gifts), paying for help (rather than just receiving help) and being assisted in food preparation. These sets of variables form level 4.

Then lastly level 5 which comprises *food intake and social problems*. The latter was assessed by having people around to talk to and to share feelings with, and being consulted by relatives and friends. Variables describing food intake were the following: food diversity score (weekly), number of meals per day, consumption of non cereal staples, cooking oil and green vegetables, self reported food satisfaction (eating enough) and whether elderly do prepare food themselves.

Thus this study's line of argument is that low socio-economic status and poor health affect food availability and social network and support, either directly or through functional impairment and low activity levels. This will lead to reduced food intake and ultimately affect nutritional status. Similarly people of higher socio-economic status, good health and functional ability, are better able to secure an adequate food availability and intake. Often they are more respected and enjoy an extended social network which will also be beneficial for their food access and consumption.

<sup>6</sup> In order to include people who did not complete timed tests but at the same time retain as much as possible of the continuous character of the variable, test times were divided into small band groups with those who did not complete the test included in the band with the longest times.

### 7.5.2 Multiple linear regression strategy

A forward stepwise regression strategy was adopted following the levels in the hierarchical model. 'Generous' P-values were chosen (in = 0.1 out = 0.2) to allow more variables to enter the equation ( $P < 0.1$ ) and these were carried down to all lower levels even if they lost significance later on. For example in level 3, all variables in the model at level 3 plus those that were significant at level 1 and 2 were offered. This strategy ensured that all important variables were still controlled for in the last level. Common P-values (in = 0.05 out = 0.1) were used in the last level although these are also arbitrary. Thus the final equation only included variables significant at the 0.05 level. The analysis was done for separate sexes and age was offered as independent variable at all levels since these were expected to be dominant confounding factors.

Various variables were used to define the outcome nutritional status, depending on what dimensions of nutritional status were taken into consideration: muscle mass (AMA), fat mass (sum of skinfolds) or both (BMI, MUAC). BMI and MUAC were selected as standard nutritional status indicators that measure both fat and muscle. The sum of skinfolds was chosen as a better measure of the body's subcutaneous fat tissue than any one of the individual skinfolds. AMA was chosen rather than CMA since the regression analyses were conducted separately for each sex and there is some question about the appropriateness of the correction factor for all ethnic groups.

High correlations between the independent variables, a phenomenon called multicollinearity, may destabilize the regression coefficients (Bryman & Cramer, 1994; Norušis, 1997). To rule out multicollinearity, correlation coefficients for the independent variables were assured to be lower than 0.80. In addition, tolerance statistics were checked in each final regression run.

Besides this, it was ensured that the assumptions for regression analysis were satisfied<sup>7</sup>. As the relationship between handgrip strength and BMI was not linear in women, all people with  $BMI \geq 25$  were excluded from analyses involving BMI. Scatter plots of the

<sup>7</sup> The assumptions are the following (Altman, 1991; Norušis, 1997):

1. The relationship between the dependent and the independent variables is linear.
2. For each combination of values of the independent variables, the distribution of the dependent variable must be normal with a constant variance.

dependent variable with each continuous independent variable and analysis of residuals indicated that the assumptions did not seem to be violated. There was no justification to analyse by age groups on the basis of anthropometry<sup>a</sup>. Nevertheless regression was also done for groups under and over 65 years of age to see whether vulnerability of older people could be described in different terms. Since this did not add information (equations with only few variables for women  $\geq 65$  years were produced consistently), only sex-specific results are presented.

The definition of high blood pressure is arbitrary and the diagnosis should be confirmed by repeated measurements over a period of several weeks. As this was not feasible, only diastolic blood pressure was included as a continuous variable.

### 7.5.3 Determinants of nutritional vulnerability

The results of the multiple regression analysis will be presented according to the different dependent variables for nutritional status. Detailed tables with full regression results for nutritional vulnerability are given in annex 7.3A-D. The presentation below is limited to the most essential elements.

Results for men with BMI, AMA and MUAC as dependent variables are presented in table 7.14. The total percentage of explained variance in BMI was 19.3%, in AMA 26.4% and in MUAC 23.0%. Variables that made a significant contribution are listed in the table with their contributions to the total explained variance ( $\Delta R^2$ ). The determinants of poor nutritional status that occurred consistently are printed in *italic*: impaired handgrip strength, low diastolic blood pressure and smoking.

---

<sup>a</sup> Values of anthropometric variables did not show a sudden rapid decline after a certain age. Therefore there was no reason to analyse by age groups so as to take into account the different slopes.

Table 7.14 Determinants of poor nutritional status in men

low BMI	$\Delta R^2$	low AMA	$\Delta R^2$	low MUAC	$\Delta R^2$
<i>impaired handgrip</i>	6.8	<i>impaired handgrip</i>	16.7	<i>impaired handgrip</i>	14.3
<i>low blood pressure</i>	1.6	<i>low blood pressure</i>	1.6	<i>low blood pressure</i>	3.0
<i>smoking</i>	4.2	<i>smoking</i>	1.8	<i>smoking</i>	2.5
rapid plate tapping	2.3	rapid chair stands	1.5	rapid chair stands	1.5
bleeding gums	1.4	receive money	1.3	receive money	0.9
no paid labour	1.2	illiterate	0.8	illiterate	0.8
light hh activities	0.9	impaired cogn status†	1.0		
kitchen garden	0.9	impaired mobility	0.9		
		no constipation	0.8		
total	19.3	total	26.4	total	23.0

† recalled words

Results for women with BMI, AMA and MUAC as dependent variables are presented in table 7.15. The total percentage of explained variance in BMI was 11.5%, in AMA 19.5% and in MUAC 14.1%. The determinants of poor nutritional status that occurred consistently (printed in italic) were: impaired handgrip strength, regular consumption of non-cereal staples and inability to offer a drink to guests.

Table 7.15 Determinants of poor nutritional status in women

low BMI	$\Delta R^2$	low AMA	$\Delta R^2$	low MUAC	$\Delta R^2$
<i>impaired handgrip</i>	2.6	<i>impaired handgrip</i>	5.9	<i>impaired handgrip</i>	4.6
<i>non-cereal staple consumption</i>	1.6	<i>non-cereal staple consumption</i>	1.3	<i>non-cereal staple consumption</i>	1.4
<i>cannot afford to offer drink to guests</i>	1.2	<i>cannot afford to offer drink to guests</i>	1.4	<i>cannot afford to offer drink to guests</i>	1.0
1 meal per day	2.1	rapid chair stands	2.4	rapid chair stands	2.4
receive food	1.1	poor health	2.2	poor health	2.9
no arthritis	1.1	nausea	1.0	nausea	0.9
low blood pressure	1.8	no kitchen garden	1.2	low blood pressure	0.9
		smoking	1.1		
		no difficulty chewing	1.1		
		rapid lock & key test	1.0		
		kyphosis	0.9		
total	11.5	total	19.5	total	14.1

Results with the sum of skinfolds as dependent variable are presented in table 7.16. The total percentage of explained variance in the sum of three skinfolds was 13.8% for men and 8.0% for women. Variables that made a significant contribution are listed in the table.

Table 7.16 Determinants of low fat reserves in men and women

thin skinfolds in men	$\Delta R^2$	thin skinfolds in women	$\Delta R^2$
low blood pressure	6.4	low blood pressure	1.1
smoking	2.6	no paid labour	1.9
illiterate	1.4	prolonged coughing	1.8
being younger	1.3	presence of wounds	1.2
impaired cogn status <sup>†</sup>	1.1	low past econ status	1.1
not eating enough	1.0	nausea	0.9
total	13.8	total	8.0

<sup>†</sup> inability to tell the day

One could argue that muscle strength also depends on muscle size and that therefore smaller persons are more likely to have a weak handgrip strength. Since muscle

development depends on long bone growth, Vaz et al (1996) corrected handgrip in two different manners: for height and for fore-arm muscle area. In the current study, handgrip was only corrected for height (height was estimated from armspan in kyphotic people). The results for men and women with BMI as dependent variable and corrected handgrip as independent variable are presented in table 7.17. The total explained variance was 20.7% in men and 12.3% in women. Variables common to the analysis with uncorrected handgrip are printed in *italic* for each sex. Regression details are given in annex 7.3E.

Table 7.17 Determinants of low BMI with corrected handgrip as independent variable

low BMI in men	$\Delta R^2$	low BMI in women	$\Delta R^2$
<i>impaired handgrip</i>	8.3	<i>impaired handgrip</i>	3.6
<i>smoking</i>	4.0	<i>non-cereal staple cons</i>	1.7
<i>rapid plate tapping</i>	2.7	<i>1 meal per day</i>	1.9
<i>low blood pressure</i>	1.4	<i>low blood pressure</i>	1.7
<i>bleeding gums</i>	1.3	<i>cannot afford to offer drink to guests</i>	1.1
<i>no paid labour</i>	1.2	<i>receive food</i>	1.1
<i>kitchen garden</i>	0.9	<i>rapid lock &amp; key test</i>	1.2
<i>light hh activities</i>	0.9		
total	20.7	total	12.3

## 7.6 Oedematous subjects

In the group with oedema, age ranged from 51 to 93 years and the mean was significantly higher than in the group without oedema (68.8 compared with 61.3 years in men,  $P < 0.001$ ; 63.8 compared with 60.6 years in women,  $P < 0.05$ ). The oedematous group also had a significantly higher proportion with impaired handgrip strength and mobility problems (annex 7.4). As oedema mainly occurred in the legs, anthropometric arm variables were still considered. Although results should be interpreted with caution, in men higher means for biceps, triceps and AFA were found in the group with oedema. Differences in group sizes may have reduced the power of the tests. Therefore socio-economic variables were only compared proportionately. Annex 7.4 shows that higher proportions occurred for many socio-economic risk factors in the oedematous group.

In summary it can be said that compared to non-oedematous people, a higher proportion of oedematous people was: older, without partnership, illiterate, of higher past socio-economic status, of lower current socio-economic status, less active, dissatisfied with food and dependent in ADLs. A higher proportion of oedematous people also had poor mobility, poor health, low exposure to alcohol and smoking, kyphosis, impairment in handgrip strength.



## 8. Discussion

### *General limitations of the study*

The study achieved a very good response rate of 85%. Some participation bias may have occurred because some people were frequently out for work in local villages. However this was kept to a minimum as the research team was present in the camp for a prolonged period and absent subjects were repeatedly visited and invited.

Bias may also have been introduced in responses due to people's expectations. Despite repeatedly emphasising that no direct personal benefit should be expected from participation in the research, it is not likely that all participants actually believed this, being in a camp environment with many aid organisations providing goods and services. The team was aware of this and was always alert for inconsistent and unlikely answers. Where these were spotted, they were corrected in consultation with the interviewee. Furthermore care had to be taken not to provoke the refugee's suspicion. Repatriation was their greatest fear, but some people also attempted to hide illegal but common activities such as working, trading or cultivating far from the camp.

Although the sample was representative of the population of 50 years and older in Chabalisa II, it cannot be assumed to be a true reflection of the same age group in Rwanda. Older adults are more likely than the younger to have stayed behind in Rwanda (voluntarily or abandoned) or to have died on their way to the camp or shortly after arrival. Therefore older refugees who were still alive in the camp at the time of the research (a year after the height of the emergency) were presumably a select group of survivors. In 1990, 2.1% of the Rwandan population was older than 65 years (World Bank, 1997). This compares with 12 % in Chabalisa II according to camp registers from HAI and UNHCR. This may indicate that the number of older people who were left behind by family members was not significant. Unfortunately such information was not collected.

### 8.1 Social and economic situation

In this sample of older refugees the male literacy rate was 44.5% and that of females 13.0%. This is much lower than the national figures of 1995 of 70% and 52% for men

and women respectively (World Bank, 1997). This difference was expected since the refugees came from a remote, rural area and most of them were farmers. In contrast to the national figures, this sample only included older adults who are generally less educated than younger people. Within the sample, the proportion of illiterate people in the oldest age group was significantly higher. A sex difference to the advantage of men is seen in both the national figures and the refugee sample, which reflects gender differences in access to education.

There was also a significant sex and age difference in marital status. The fact that men were more often married than women reflects a tendency of widowers to remarry rather than widows. This tendency may have been stronger in a refugee population given the desire to compensate human losses. Therefore older men married younger women to start a second family. Even more than in ordinary communities, widowhood is a fact of life for the majority of older female refugees, which often entails a loss of status and diminishing economic security.

Almost 38% of the sample was of reasonable economic status in Rwanda (farmers with land and livestock). Not surprisingly the economic status as refugees was much worse for quite a number of people. More than 60% in the camp said they could not afford to offer a drink to guests and among them was a significantly higher proportion of women and older people. Female and older refugees, groups that were less educated and of poorer socio-economic status before the war, were also economically worse off in the camp. Most refugees fled on foot and could take few belongings with them. However some of the richer people brought cash and thus had more opportunities to set up a business. Furthermore educated people and those who spoke languages such as Swahili, English or French had more chance to find employment, make a deal with Tanzanian food distributors or lease land from Tanzanians. Other authors also reported that poverty prevailed in the oldest and in women (Evans, 1990; Oranga, 1997).

Despite the fact that there is no Rwandan tradition of living in extended families and 40% of the older adults had no partner, only 2.2% lived alone and 4.1% lived without younger adults. This was low compared to 8.8% living alone in rural Malawi (Chilima, 1998) and 30% in rural Kenya (Waswa et al, 1988). However only 1.6% of Southern Ethiopian

elderly lived alone (Dejene, 1995). The low proportion of older refugees living alone may partly be explained by the regulation upon arrival that roofing sheets were distributed to groups of minimally four persons. Those who lost their relatives or did not arrive at the same time had no choice but sharing a roof with strangers, which was a bitter experience for many. Although living arrangements changed over time, living alone remained uncommon given the limited space and resources, and the custom for old people to live with a grandchild. At the time of data collection, living with spouse, children, grandchildren or a combination was most common, although some elderly also lived with other relatives (e.g. orphans) or friends. It was again women and the oldest age group who were more likely to live with grandchildren and (for the oldest age group) without younger adults. Living arrangements also explain why older age groups were less likely than the younger to receive care from children when being ill but more often from grandchildren instead. However it possibly also meant that the dependency ratio of older people's households was higher, implying that they may have had more care giving responsibilities and were under higher economic pressure.

One-fifth of the older adults reported receiving food as a gift and 17% said they received money. This came primarily from children but also from friends and neighbours. Apparently more formal support systems such as the church did not play a major role. Studies among Ethiopian and Polynesian elderly reported similar levels and sources of assistance (Barker, 1989; Dejene, 1995), however 89% of a sample of rural Kenyan elderly admitted receiving some assistance from children and 53% from grandchildren as well (Catell, 1990). Both sexes used gifts mostly for household consumption. Regarding labour wages, group discussions revealed that male agricultural labourers, in contrast to female, preferred to be paid in money instead of food to meet personal needs. This may indicate that women felt more responsible in contributing towards household income (e.g. as head of the household) or that they set other priorities (e.g. caring for children rather than for self). Food and financial gifts from relatives and friends were more frequently received by women than by men and by older people in the case of financial support. Received money was predominantly used to buy food, indicating the greatest felt need.

Regarding perceived emotional support the vast majority reported having people around to talk to (99%) and to share feelings with (94%) and felt respected in the sense that they

were consulted by relatives (91%) and did not have to pay for assistance (93%). These proportions are remarkably high given the concerns and difficult relationships expressed in the case studies. One of the reasons why respect shown to older people may diminish after being displaced is the inability to provide an inheritance, a crucial issue that older refugees are faced with. It is also possible that emotional support to older people had not actually changed, but was perceived to be inadequate. In Chinese elderly emotional support was found to be more crucial than instrumental support and contributed to better health status (Liu et al, 1995). The same was found for older women recovering from hip fracture (Mutran et al, 1995). Despite the fact that the validity of our research questions was checked with key persons, it remains hard to assess intimate issues such as emotional support and respect in another culture, particularly in an unstable situation where people are distrustful. In-depth interviews were probably a better tool to discuss these topics than the semi-structured interviews. Women felt significantly less respected than men and had less possibilities to share their feelings. The oldest were significantly less likely to be consulted. It seems that economic position is a more important determinant of well-being and respect than social position. This is supported by findings from several Asian countries that elderly who lack individual economic status, tend to occupy an inferior role in the household regardless of the economic status of the household as a whole (Evans, 1990; Martin, 1990 in: Sen et al, 1993). Not surprisingly, older refugees and female in particular, were faced with a deteriorating status.

## 8.2 Health situation

At the time of the research, the camps in Karagwe district could be characterised as being in the post-emergency phase. The crude mortality rate in Chabalisa II did not generally exceed the normal rate for developing countries of 0.5/10,000/day (Hakewill, 1991). Health profiles were similar to those of the local Tanzanian population with malaria and respiratory infections most frequently diagnosed followed by skin diseases and diarrhoea. It is understandable that the incidence of diarrhoea increased in times of water shortage (October-November) and during the rainy season when firewood was scarce and people used to cook for more than one day (January-March). Scabies was more prevalent among the refugees than in the Tanzanian community probably due to irregular distribution of soap and sharing of clothes and bedding. Rampant scabies was

also noted among refugees in Zaire when soap was not distributed (Reed & Habicht, 1998).

Cough, nausea, fever and high blood pressure were the most commonly reported signs and symptoms of health problems among older Rwandan refugees. Respiratory infections and cough may have been relatively highly prevalent due to poor housing and clothing in combination with the climate (strong, dusty winds in summer and cold humid conditions in winter). According to health staff, fever symptoms were mainly malaria-related and the camp was indeed situated in a swampy valley where mosquitoes were present. A blood pressure above 140/90 mm Hg<sup>1</sup> was diagnosed in 19% of the refugees which was higher than the 10% reported among older Rwandan hospital patients and 12% among older rural Kenyans<sup>2</sup>, but similar to the 20% found among rural Balinese<sup>2</sup> (Mets, 1993; Waswa et al, 1988; Syryani et al; 1988). A higher figure of 25% was found among Tanzanian hospital patients (Matuja & Ndosi, 1994).

Chewing, mobility and visual problems were the most frequent complaints of sensory and disabling nature. As mentioned before, chewing difficulties (47%) and nausea (13%) were probably partly caused by frustrations with the diet, although mastication problems were also found to be highly prevalent (41%) among Ethiopian elderly where "injera", a soft sour bread is the staple food (Dejene, 1995). Among Saharawi refugees who mainly eat rice, cous-cous and bread, chewing problems were not reported among adults of all ages (Branca, 1998). Health problems in other developing country elderly populations also centred around senses, chewing problems and reduced mobility (Manton, 1987; Wilson, 1991; Fernando & Seneviratna, 1993; Dejene, 1995).

Most signs and symptoms were more prevalent in women and in older age groups and these groups also significantly more often perceived their health as poor. Similar findings have been reported elsewhere (Bassey et al, 1989a; Fernando & Seneviratna, 1993; Dejene, 1995). It is unclear why women's health status was poorer than that of men. It has been hypothesised that women suffer more from chronic conditions that are nonfatal. There is evidence that both men and women report fairly accurately, so it can be assumed

<sup>1</sup> WHO defines normotension as systolic blood pressure <140 and diastolic <90 mm Hg (WHO, 1996).

<sup>2</sup> Above 160/90 mm Hg.

that reported symptoms and physical complaints truly reflect health and functional problems (Merrill et al, 1997). This may indicate gender differences in physical and mental strain during the course of life. Particularly in rural developing country populations, girls may receive less care and medical attention than boys and are likely to experience many pregnancies in poor conditions. This cohort of women gave birth to an average of nine children<sup>3</sup> which presumably had a health impact.

Reporting poor health probably embodies more than the presence of medical conditions and physical problems. As mentioned, it was noticed that the Rwandan refugees seemed to incorporate socio-economic conditions in the interpretation of their health status. Thus in addition to the significantly greater occurrence of health problems among female and older refugees, their disadvantaged socio-economic situation may have contributed to a relatively poor perceived health.

Men significantly more often smoked and consumed alcohol, although there were no heavy smokers in the sample. These were presumably indicators of health rather than of socio-economic status since high levels of smoking and drinking were related to a high BMI. Drinking beer and smoking was common among older Rwandan hospital patients, however inhalation was only practised by few. Although alcohol consumption was fairly high, there was no correlation with presence of cirrhosis (Mets, 1993).

The relatively small number of people that presented signs of micronutrient deficiencies, gastro-intestinal disorders and tuberculosis, must be attributed to the different ways of supplementing the diet, the presence of fortified foods in the ration and the relatively high water quality and sanitation standard in the camp. However clinical assessment of vitamin deficiencies is not very reliable as it is non-specific, poorly sensitive and prone to observer error. Therefore sub-clinical deficiencies may very well have been present and perhaps also contributed to the generally poor self-rated health and vague complaints such as headache and weakness.

---

<sup>3</sup> This compares with a national average of six calculated over the period 1988-1993 (World Bank, 1995). Older rural female Rwandan hospital patients had had an average of nine children (Mets, 1993).

Frequent occurrence of anxiety and depression symptoms in the last year were reported by 22% of the sample. Among rural Balinese elderly 18% were found to suffer from anxiety and 14% of depression, which was judged to be relatively high for a stable situation. The elderly believed their symptoms were amongst others caused by tension within families and loneliness (Syryani et al, 1988). In a study in rural Botswana, 9.2% of the elderly were diagnosed as depressed (Clausen & Sandberg, 1994). It is acknowledged that assessment techniques were not exactly the same and refugees would not easily have disclosed personal experiences, assuming the questions were valid. However agricultural work and gardening has always been their main and favourite occupation, and engaging in such activities, for which there were more possibilities in and around Chabalisa II compared to the average refugee camp, may have been an effective coping mechanism for the functionally able.

On the other hand, older people in the camp complained about boredom since they were less active than they desired. Moreover it was said that in Rwanda younger people used to spend more time listening to elders. This may just be a perception but may also be related to the loss of friends and relatives, the increased need to generate income and the long time spent fetching firewood and water. Less attention from younger people in times of greater boredom and distress may have resulted in a common feeling of loneliness and loss of respect, particularly among the oldest old and functionally impaired.

The level of customary activity among older refugees was quite high: almost 72% was gardening regularly and 71% and 42% were engaged in light and heavy household activities respectively. This may be partly attributed to the fact that this was a self-selected group of relatively fit older people, although it is generally seen in developing countries that older people who live at home remain active into very old age. A considerable number of older Rwandans had been working until or close to hospitalisation, and an average of five hours per day were spent working in the fields (Mets, 1993). Likewise, the Malawian and Indian elderly showed high activity patterns (Chilima, 1998; Manandhar, 1999) and a Balinese survey reported that 53% of the elderly worked as usual and 42 % worked less compared with younger years (Syryani et al, 1988).

### 8.3 Food and diet

Although this study was not designed to evaluate the adequacy of the food ration, a number of factors relating to the ration have been observed and are included in this section.

The cultural acceptability of whole grain maize, the main item in the ration, was low: dried maize grain used to be kept as seed or chicken feed in Rwanda. Beans were at times replaced by peas or lentils that were initially also poorly accepted. Unfortunately the composition of the ration is still largely determined by the food donors offer rather than what recipients need. It seems particularly difficult for older people to get used to other food, not only psychologically but also physically as whole grain is difficult to chew and digest and requires long cooking times and much firewood. After beans, CSB was mentioned as the best distributed food item. Although initially also unfamiliar, it was quickly accepted since it was easy to prepare and also used in feeding programmes which convinced people of its nutritional value. It was not unusual for elderly to have meals of just thin, maize porridge for a prolonged time. If such a meal was mixed with fortified CSB it may have been adequate provided it was taken in sufficient quantities. However even counting thin porridge as a meal, only just over half of the older population reported eating three meals per day regularly.

Maize meal was more acceptable than whole grain but it was only distributed occasionally as WFP was not successful in milling the major part. Most elderly had the grain milled whenever possible and sold part of the ration to pay for milling (oil, maize or sometimes CSB). Naturally this had consequences for the nutritional value and palatability of the diet. If psychological malnutrition exists, it was certainly present here: quite a number of old people were literally sick (nausea) of the monotonous and unfamiliar diet and could only swallow porridge (see case studies). Apathy and hopelessness may also have been underlying causes. Complaints about physical living conditions particularly food, water and shelter, have masked deeper psychological stresses (Needham, 1994).

The energy value of the ration was not assessed directly, but calculated from the nutritional values of commonly used food aid commodities in emergencies. Depending whether maize was distributed as grain or meal, the energy content of the ration was



1,953-2,093 kcal/capita/day of which 13% was from protein and 16.5% from fat (table 6.10). This was reasonably in line with the guidelines<sup>4</sup> (WFP/UNHCR, 1997). However this does not account for losses during distribution<sup>5</sup> and due to milling, storage, exchange or otherwise. It has been demonstrated that many elderly do 'lose' food in these ways and consistently complained that food was insufficient. On the other hand the guidelines apply to the initial emergency period when the population entirely depends on food aid which was for many no longer the case.

Unfortunately the micronutrient content of the ration could not be assessed. However, assessed consumption frequency showed that generally only maize and pulses were eaten daily and that dietary diversity was low. Dietary diversity has been shown to be a fairly good indicator of nutritional adequacy in African children (Hatløy et al, 1998). Despite the poor diet of many elderly, frank signs of micronutrient deficiencies were very rare, apart from low levels of pale conjunctiva, sore gums and prolonged wound healing time that would suggest anaemia and vitamin C deficiency. Clinical signs of anaemia were only found in 2.2% of the Rwandan refugees, but the prevalence of marginal hemoglobin levels may have been much higher, considering the low bio-availability of iron from a diet that consists largely of vegetable sources. Among Saharawi refugees in Algeria, mild to severe anaemia was diagnosed in 44.2% of the women over 45 years and in 27.7% of adult men of all ages. Clinical signs of vitamin C deficiency were present in 19.2% of all adults. The Saharawis were more dependent on the ration than the Rwandans, but it consisted of more items including supplementary foods that were theoretically intended only for vulnerable individuals. Assuming the entire household benefited, the ration still did not meet the requirements of energy, protein, vitamin A and thiamin (Branca, 1998). Given the relatively high prevalence of nutrient deficiencies that have been reported in elderly refugees (pers.com. Branca, 1998), and the monotonous diet and faulty food habits of many older refugees in this population, it is likely that they will be amongst the first to suffer from deficiencies.

<sup>4</sup> 2100 kcal total energy of which 10-12% from protein and at least 17% from fat.

<sup>5</sup> On average 10% according to Memisa's food basket monitoring.

Only few elderly lived alone and there was mutual help in the form of sharing, pooling of resources and rations (see case studies). Of the elderly who did cook, 5% of the men and 20% of the women did not receive help in this task and remarkably the proportion of older people was significantly higher. This may indicate a risk for their access to food. Older people had fewer possibilities to supplement the diet than younger adults. Employment was often found at quite a distance (several hours walk) and farmers generally preferred to employ younger adults. Moreover only 21.5% and 17% received support in the form of food or money. Therefore older people were likely to have a poor diet both in quantity and in quality and women in particular who ate significantly less meals per day. This is highlighted by the fact that in the oldest age group ( $\geq 70$  years) only 10% regularly ate three meals per day and 14% said they ate sufficiently. The vast majority never ate animal products (including dairy) or fruit, and vegetables were only eaten occasionally or several times a week. Thus they were probably at risk of micronutrient deficiency.

Health personnel had the impression that the nutritional status of adults was deteriorating after cutting down the amount of distributed food following the verification exercise. This observation and the sudden rise in child malnutrition in the period when mobility was restricted, illustrate the relative importance of food sources other than the general ration. Taking into consideration the composition of the ration and presumably also the micronutrient content, its monetary value may be more important than the nutritional value. In this light the official prohibition to sell or exchange ration items is controversial. The nutritional status of the refugee population would certainly have been worse if this regulation and the mobility restriction had been enforced seriously. Other studies have also shown that refugees with opportunities to care for themselves fared better than those confined to camps (van Damme, 1995). The benefits may extend beyond the physical aspects of nutrition as the psychological effects may be equally important.

#### **8.4 Anthropometry**

##### ***Limitations***

This study demonstrated differences between age groups in many anthropometric variables in older Rwandan refugees. This may reflect biological, secular and/or methodological variation. Older people were shorter, lighter and had less arm muscle tissue than their younger counterparts. Longitudinal studies have described biological

changes that occur with ageing, which might account for these patterns (Lohman et al, 1988). However such conclusions cannot be drawn from a cross-sectional study. Younger people in the study sample may have lived in different conditions; hygiene, health care and food intake may have contributed to different body size and composition. Further it is known that differences in anthropometric variables not only exist between sexes, and age groups, but also between races (Chumlea et al, 1986; Delarue et al, 1994; Launer, 1996). However due to the scarcity of anthropometric data of older Africans, comparison with other studies will also refer to elderly people of other races. Comparisons are in fact dual: African versus non-African and refugee versus non-refugee.

This refugee sample was unique in various ways and the results of this study should be interpreted bearing the following issues in mind. We are concerned with a self-selected group in that those with poorest nutritional status may have been left behind or have died on the way to the camp or soon after arrival. Furthermore, there is reason to assume that the refugees had a reasonable nutritional status before departure. Finally the study took place in the post-emergency phase and HelpAge International had been present in the camp for more than a year, advocating for the interests of older people and providing support. These facts make it likely that the nutritional status of this particular refugee population was better than at the height of an emergency and better also than of those who stayed behind in Rwanda.

#### **8.4.1 Height and alternatives to height**

As expected, men were generally of bigger size and leaner than women. The means for height and the long bone measurements (armspan, halfspan, demispan and kneeheight) were lower in older age groups in both sexes. Height differences between age groups may partly be explained by the effect of ageing. Several studies still found a loss in stature with age after removing secular trends (van Leer et al, 1992; SENECA Investigators, 1996a). However secular trends did play a role in this cross-sectional study. This was affirmed by significant differences in means of most long bone measurements between the age groups (except kneeheight in men), which are expected to remain relatively stable over the lifespan. Cohort differences may also be affected by selective survivorship (selective mortality and representation in the camp). Increasing difficulties with old age in correct positioning for the measurements is not likely to have

played an important role. Interestingly, armspan significantly exceeded height in both sexes. This difference is predominantly due to the fact that armspan exceeds height in black races (Reeves et al. 1996) and perhaps to a small extent to the age-related decline in height that was less seen in armspan.

Kyphosis was visible in 5% of the sample, which is much lower than the figures of 15% and 17.3% found in India and Malawi respectively (HAI & LSHTM, 1997; Manandhar, 1999). This probably reflects the fact that the sample was not representative of the total older Rwandan population. Not surprisingly, kyphosis was significantly more prevalent in the oldest age group, a finding also reported by others (Milne & Lauder, 1974; Milne & Williamson, 1983; Ensrud et al, 1997).

Stature is important because of the role it plays in calculating nutritional status indices such as BMI. If height cannot be measured accurately, it can be estimated from an alternative measurement. In the USA kneeheight is generally preferred since it is a constituent of stature (Chumlea et al, 1998). However demispan has also been recommended and has been used in several UK studies (Bassey, 1986). The WHO recommends either kneeheight or armspan but expressed a slight preference for kneeheight since armspan includes many joints and is believed to yield an estimate more closely correlated with young adult height (WHO, 1995). In this study prediction equations for height were obtained from kneeheight and several arm measurements from non-kyphotic people (section 7.1.3). The estimated height reflects current stature that may be less than maximum attained stature during young adulthood.

If height and alternative measurements had been obtained from young adults in the same population, we would have been able to establish the relationship between these measurements in young adults. However applying those equations to older people would have estimated their maximum attained stature during young adulthood; arguably it is preferable to account for invisible age-related height loss in the calculation of BMI.

In both sexes the equations with kneeheight were slightly better than those with arm measurements, as they produced the highest correlation and explained variance ( $R^2$ ) and the lowest standard error. Similar equations were recently developed from a sample of

474 black men and 481 women from NHANES III data (Chumlea et al, 1998) which gave lower  $R^2$  and higher standard errors as shown in table 8.1.

Table 8.1 Recommended equations for predicting height in black Americans and Rwandan refugees

Men	$R^2$	SEE	n
non-Hispanic black Americans:			
height = 79.69 + 1.85 kneeheight - 0.14 age	0.70	3.81	474
Rwandan refugees:			
height = 62.61 + 2.07 kneeheight - 0.09 age	0.74	3.37	389
Women	$R^2$	SEE	n
non-Hispanic black Americans:			
height = 89.58 + 1.61 kneeheight - 0.17 age	0.63	3.83	481
Rwandan refugees:			
height = 63.27 + 2.03 kneeheight - 0.10 age	0.71	3.29	391

Differences between kneeheight and armspan equations in the Rwandan population were very small. Considering nutritional assessments in unstable situations in developing countries, armspan is a more convenient measurement. Moreover, in situations where the full armspan cannot be obtained, halfspan may be measured and multiplied by two. For these reasons the model with armspan was chosen to predict height.

Since the relationship between height and armspan depends on ethnicity, population specific equations will need to be developed (Steele & Chenier, 1990; Reeves et al, 1996). In the current study, age did not reach significance in the equation with arm measurements in men. This was not anticipated as height is correlated with age. In Parker's (1996) equations from a smaller study with a wider age range, age came into the equation for men but not for women. Possible explanations were the age distribution in the female group with predominantly younger women and problems that older women had in fully extending the arms. Allen (1989) compared height and armspan in older English women and although the difference was greater than in young women, the larger individual variation made it impossible to show a significant relation with age. Steele &

Chenier (1990) compared black and white women of a wide age range and came up with equations for both races that included armspan and age.

Table 8.2 shows anthropometric characteristics of older adults included in the National Health and Nutrition Examination Surveys I and II of the USA, from urban India, rural Malawi and Rwandan refugees. Comparing height and armspan across populations, we see similar patterns for the two variables: the Americans are biggest, the Indians are smallest, and the two African populations fall between the Americans and Indians and do not differ much from each other.

Table 8.2 Anthropometric means in older adults<sup>†</sup> from Malawi, Rwanda and the USA

	Sex	India (n=1297)	Malawi (n= 284)	Rwandan refugees (n=828)	Black Americans (n=1669)
Height (cm)	m	162.0	165.8	166.1	172.1
	f	148.0	155.2	156.9	159.8
Armspan (cm)	m	170.0	177.4	178.7	n.av.
	f	155.0	164.8	165.6	n.av.
Weight (kg)	m	53.2	54.1	55.8	75.4
	f	45.3	49.0	52.5	73.5
BMI (kg/m <sup>2</sup> )	m	20.5	19.8	20.0	25.4
	f	20.6	20.3	21.2	28.8
MUAC (cm)	m	24.1	25.0	25.1	31.7
	f	23.0	25.9	26.1	32.5
Triceps (mm)	m	10.2	7.3	5.9	10.8
	f	14.2	12.6	11.8	26.7
CAMA (cm <sup>2</sup> )	m	25.3	31.5	33.2	54.6
	f	21.3	32.0	33.7	40.3
AFA (cm <sup>2</sup> )	m	n.av.	8.8	7.2	16.7
	f	n.av.	15.5	14.6	38.9

Source: Frisancho (1990), Chilima (1998), Manandhar (1999).

<sup>†</sup> Over 55 years of age for Malawi and over 50 years for the other populations.

### 8.4.2 Weight and BMI

The present results replicated those of previous studies in that men had a higher mean weight than women, a lower BMI and there was greater variation in BMI for women (Galanos et al, 1994). Comparing the refugees' weight and BMI to those of black US elderly, we see that black Americans are much heavier and fatter (table 8.2). Similar differences are seen for BMI. Mean BMI values in elderly people from several European towns ranged from 25.2 to 27.4 kg/m<sup>2</sup> in men and from 23.9 to 28.6 kg/m<sup>2</sup> in women (SENECA Investigators, 1996a). These differences in body measurements presumably reflect better nutrition and higher living standards in the US and Europe. Of the developing country populations, the Indians had the lowest values, whereas the Rwandans were slightly above the Malawians.

Regarding the BMI distribution in the study population, more than 75% fell in the normal category (18.5-25 kg/m<sup>2</sup>). Of the undernourished people (<18.5 kg/m<sup>2</sup>), the largest proportion was mildly undernourished (17-18.5 kg/m<sup>2</sup>) and only few people were severely undernourished (<16 kg/m<sup>2</sup>). Overweight (>25 kg/m<sup>2</sup>) was also present, but mainly among women and only to a mild degree as BMIs above 30 kg/m<sup>2</sup> were rare. Possible explanations have been given in the first part of section 8.4.

Weight was significantly lower in older age groups which is consistent with other studies (Chilima, 1998; Manandhar, 1999). No significant differences in BMI were found between age groups in either sex, although there was a weak but significant negative correlation between BMI and age in women. The same was found in active, healthy Chinese elderly (Woo et al, 1988). However lower mean BMIs at higher ages were found in rural Malay women, sub-urban Guatemalans and French elderly (Rolland-Cachera et al, 1991; Yassin, 1991; Herman et al, 1998).

Elderly Mozambican refugees in Zimbabwe had the same mean BMIs as Rwandan refugees (20 kg/m<sup>2</sup> for men and 21 kg/m<sup>2</sup> for women). Among displaced elderly in Mozambique, women had a mean BMI of 17 kg/m<sup>2</sup> and the proportion with BMI<15 kg/m<sup>2</sup> was higher for both sexes than among the displaced in Zimbabwe. Those in Mozambique had on average been in the camp for less than six months and therefore

were still suffering to a greater extent from trauma (Ramji & Thoner, 1991). It is unclear whether kyphotic people were included in this study.

Ethangatta et al (1996) studied very poor and low-income older women living in Nairobi. The mean weights in these groups were 55 kg for very poor and 64 kg for low-income women with mean BMIs of 23 kg/m<sup>2</sup> and 26 kg/m<sup>2</sup> respectively. The present results for refugee women (table 8.2) were lower than those of Nairobi women, but very similar to BMIs of 20.1 kg/m<sup>2</sup> in both sexes of older rural Gambians (Aspray et al, 1994). Unfortunately not all studies made explicit what was done in case of kyphosis. Ordinary height may have been used resulting in an overestimation of BMI. Some studies excluded kyphotic people, which may have resulted in exclusion of the worst cases.

A recent survey among Saharawi refugees in Algeria gave BMI figures for adults aged 60 years and older with height estimated from halfspan based on regression equations from younger adults in the same population. Undernutrition amounted to 25.0% in men and 11.5% in women. Severely undernourished were 4.2% and 3.3% respectively. The proportions of severely undernourished people and undernourished men were higher in Saharawi refugees compared with the Rwandan refugees. Possible explanations have been given in the first section of this chapter. Among Saharawi refugees, undernutrition in men older than 60 years was higher than in young adult men, but the reverse was seen in women. The prevalence of obesity among older Saharawis was much higher than among Rwandans (Branca, 1998).

In studies among older urban Indians and rural Malawians, BMI was calculated in the same way as in the present study. Interestingly Rwandan refugees had higher mean weights and BMIs than urban Indians and rural Malawians as shown in table 8.2 (Chilima & Ismail, 1998; Manandhar, 1999). Also the prevalence of low BMI (<18.5 kg/m<sup>2</sup>) was higher in Malawi: 36.1% for men and 27.0% for women. This may be explained by the fact that the refugees were a select group and had at least access to regular basic food in the camp which is not always the case in stable low income communities.

The prevalence of low BMI among kyphotic people was much higher than among non-kyphotic people and this was not explained by age. This illustrates the importance of



including kyphotic people in nutritional status assessments. In a European population-based study, the occurrence of vertebral deformity was found to be associated with low body weight both absolutely and adjusted for height using BMI (Johnell et al, 1997).

#### 8.4.3 Estimates of fat and muscle tissue

Estimates of fat and muscle areas were derived from arm circumference and triceps skin-fold thickness. The formulae are based on the assumptions that the arm is cylindrical and that fat is evenly distributed around its circumference. It has been demonstrated that anthropometric measurements of arm muscle area over-estimate by 15-25% as compared with computed tomography, but pairs of values were highly correlated (Heymsfield et al, 1979). Recently Bemben et al (1998) confirmed that anthropometry under-estimated the loss of muscle mass in 70-74 year old American men by 7.2 kg as compared to under water weighing. Anthropometric techniques fail to distinguish between skeletal muscle and other components of fat free mass. This is particularly relevant in the elderly as there is evidence that skeletal muscle is being marbled by fatty tissue (Rosenberg, 1997).

Arm fat area estimates agreed within 10% of computed tomography values. Despite the limitations, it has been recommended to assess nutritional status on the basis of muscle and fat areas (two-dimensional) rather than direct skinfold and circumference measurements (Himes et al, 1980; Frisancho, 1981), although Reid et al (1992) suggested MUAC may account for the greatest proportion in variation of lean and fat tissue masses. Furthermore, observed changes with old age in the distribution of subcutaneous and internal fat, and compressibility and elasticity of subcutaneous fat, may cause anthropometric measurements to underestimate fat tissue and overestimate muscle tissue (Himes et al, 1980; Frisancho, 1981; Baumgartner et al, 1995; Bemben et al, 1998). Nevertheless anthropometry can provide valuable information in comparisons between older populations.

Comparing mean values for MUAC, CAMA, triceps and AFA of Rwandan refugees with those of black American men and women (table 8.2), much higher values for all variables were seen in Americans. The same was true for MUAC and triceps measurements of European elderly (SENECA Investigators, 1991a). However the Rwandan values were closer to those found in older people from other developing countries.

MUAC means in the Rwandans were nearly the same as in the rural Malawian population but urban Indians had lower values. Characteristics of the Indian sample were reported to be broadly similar to those found amongst other Asian communities of low socio-economic status (Manandhar et al, 1997a). However in other rural and urban Asian populations, MUACs were similar to those of the Rwandans (Yassin et al, 1991; Strickland & Ulijaszek, 1993). It is unclear to what extent this can be ascribed to different activity levels in urban and rural elderly. Similarly Herman et al (1998) found a smaller muscle size in sub-urban Guatemalan elders compared to that of rural elderly. MUAC and uncorrected AMA values of rural black South African pensioners of advanced mean age (78 years for men, 80 years for women), were very similar to those in the oldest group (mean age 75) of refugees (Ndaba & O'Keefe, 1985).

Triceps skinfold was the only fat measure reported in the study on Malawian elderly and Nairobi women. For both sexes the values in the Malawi sample were close to those of the refugees (table 8.2). However the mean triceps thickness of female refugees of 11.8 mm was well below the figures of 16.9 mm for very poor and 21.8 mm for low income female Kenyans (Ethangatta et al, 1996), but similar to a value of 12.2 mm in female rural Gambians (Aspray et al, 1994). Triceps values in male refugees and Gambians were also similar (5.9 mm and 6.4 mm respectively).

Refugee women had a significantly higher mean AFA than men, which is a common sex difference. However, men did not have significantly more arm muscle tissue (adjusted for bone mass) than women. This is remarkable, although it also occurred in the Malawi sample, and is unlikely to be caused by activity levels since men reported significantly more engagement in heavy household tasks and agricultural work than women.

It is possible that the sex-specific correction factor for bone mass is inappropriate for this ethnic group. However, sex differences in uncorrected AMA were also small in the refugees<sup>6</sup>, whereas black American women had a substantially lower mean corrected AMA than men. Table 8.2 shows that mean AMA in the refugee sample was higher than in the Malawi sample and mean AFA lower. However all figures were substantially lower than those for black Americans.

<sup>6</sup> Much smaller than in older Nigerians (Harries, 1985) and Guatemalan elderly (Herman et al, 1998).

Age-related changes seen in upper arm anthropometry are not consistent. Longitudinal studies have predominantly shown reductions in muscle mass with age, or at least a tendency towards lower values, although slight increases or fairly constant values for circumference and fat measurements in old age have been reported too (Bishop et al, 1981; Chumlea et al, 1989; Rolland-Cachera et al, 1991; Chapman et al, 1996). In this study significantly lower MUAC, AMA and CAMA values were found at more advanced age in both sexes. There was no difference in biceps, triceps and subscapular skinfolds and AFA between the age groups, and older men had even slightly thicker triceps skinfolds and a higher arm fat percentage than younger peers. These findings agree with those of Baumgartner et al (1995) who used more accurate techniques in addition to anthropometry. Loss of fat free mass was substantial and continued to occur into the ninth decade even though the sample consisted of relatively healthy, active older people. Fat mass decreased with age only in women, although most skinfolds did not change significantly. It was suggested that the age-related accumulation of abdominal and visceral fat may predominantly occur during middle-age, with little or no further increase during old age.

Most researchers seem to agree that the most dramatic change in body composition over the decades of life is the decline in muscle mass. Sarcopenia, or loss of skeletal muscle mass and strength in old age, may have serious implications for functional and health status (Dutta, 1997). Adequate muscle strength is essential for satisfactory performance of every day tasks and weakness often results in difficulties rising from a chair or getting out of bed, slow gait speed, balance problems and falls. Moreover significant positive correlations were found for CAMA with plasma pre-albumin and retinol-binding protein in healthy Chinese elderly (Woo et al, 1988).

#### **8.4.4 Classifying undernutrition in older people**

In the absence of validated BMI and MUAC cut-offs to classify undernutrition in older people (WHO, 1995; de Onis & Habicht, 1997), cut-off points for adults proposed by Shetty & James (1994) for BMI and by James et al (1994) for MUAC were used. Because of changes in body composition, the validity and interpretation of these cut-offs for the elderly, particularly those over 70 years, are in question. The validity of BMI cut-offs is questionable in any case, as it is not clear whether they represent marked changes in risk of mortality or morbidity. This study was not designed to investigate the validity

of the cut-offs proposed by Shetty & James (1994); to examine the risk of mortality would have required a much larger sample size. It should be noted however, that where possible, notably in the multiple regression analysis, BMI was used as a continuous variable.

The proportions classified as undernourished using low MUAC were substantially smaller than those classified using low BMI. This was also seen in James' data (1994) and in the Malawi study (Chilima & Ismail, 1998). These findings bring into question the validity of the MUAC cut-offs proposed by James et al (1994) for rural African populations. These cut-offs are based on data from younger third world adults and James' own data also show that rural Africans have higher MUAC values than rural Indians of similar age. This suggests that MUAC cut-offs (and/or BMI cut-offs) may need to be region- and age-specific. Supportive to this view are the findings that accepted cut-off points for overweight and obesity (25 and 30 kg/m<sup>2</sup> respectively) corresponded to higher percentages of body fat in an Indonesian population compared to a Dutch (Gurrici et al, 1998), and that Asian Americans of lower BMI than white Americans were fatter (Wang et al, 1994).

Considering the ability of MUAC measurements to predict poor nutritional status in this population it can be concluded that MUAC is not a very sensitive screening tool, particularly not in the middle BMI category. James et al (1994) came to the same conclusion. Specificity was higher than sensitivity whereas the reverse is required when using MUAC to identify those with poor nutritional status. Nevertheless the MUAC cut-off of 21.7 cm may be adequate to identify the severely undernourished. This group may be of interest for nutrition intervention during the acute emergency phase. The MUAC cut-off of 23.7 cm or the BMI cut-off of 18.5 kg/m<sup>2</sup> would only be useful in the post-emergency phase, for instance in identifying vulnerable people who need a food supplement, social or physical support.

## 8.5 Functional ability

### *Limitations*

The greatest problem in assessing functional ability, whether by physical tests or ADL questionnaire, is the lack of adequate validity. The ADL questionnaire was originally developed for use in developed countries where people generally survive longer and gradually lose their independence. The ADL questionnaire used in this study was adapted to the local circumstances to make it more appropriate for use in this population. Despite the adaptations it still contained some less appropriate questions that were excluded from the analysis. Another impediment to ADL assessments is lack of standardisation resulting in various sources of variation (Wiener et al, 1990). The rather subjective nature of self-reported assessments for health and function does not necessarily compromise accuracy or validity compared to more objective methods (Pinholt et al, 1987; Elam et al, 1991; Merrill et al, 1997).

Physical tests are assumed to be more objective but test performance also depends on motivation of the subject, encouragement by the measurer and even psychological and socio-demographic factors (Kaplan et al, 1996; Kempen et al, 1996). During the field work we noticed that encouragement was especially necessary for the chair stands and plate tapping tests, and an association was found between adequate BMI and poor performance in plate tapping and the lock and key test, which could not be explained. Since standard values for physical performance and dependence in ADLs do not exist, results can only be compared within and between populations.

Differences in judgements between subjects and observers may also have been a source of error. Remarkable was the higher dependency score in observed mobility compared to self-reported mobility. Perhaps older people have different expectations than younger people and do not consider themselves impaired so long as they manage to get around even though they may move more slowly and be less flexible.

### 8.5.1 Dependence in activities of daily living and mobility

Generally dependency levels were low, supporting the impression that the study sample was an able-bodied group. According to expectations, older age groups were more likely to be dependent than younger peers. Where numbers allowed statistical analysis, women

were found to be slightly more dependent than men in activities of daily living and dimensions of mobility. This could partly be explained by more frequent health problems among women that may have caused impairments without affecting mortality, or men may represent a more selective group of survivors since men's life expectancy is lower.

As mentioned earlier, caution should be taken in comparing functional ability data with other studies due to methodological and definition differences. In this refugee sample, more than 90% were independent in basic daily activities. Similar figures were also found among Sudanese refugees (Godfrey, 1985), rural Malawians (Chilima, 1998) and Javanese elderly<sup>7</sup> (Rudkin, 1994) and an even higher figure of 95% was found in Zimbabweans (Allain, 1997). Lower independence levels were found among rural and urban older adults in some other developing countries: in Sri Lanka 82% and 76% and in Egypt 74.5% and 69.0% for men and women respectively (Fernando & Seneviratna, 1993; Lamb, 1997). These studies used ADL and IADL scales that do not exactly cover the same items, hence no direct comparison of the total independence figure with the refugee sample is possible. However comparison of individual ADL figures that the studies had in common, showed that Rwandans were most independent. The same was true for a large group of non-institutionalised elderly from nine developing countries<sup>8</sup> (Lamb, 1996). A 15-item scale was used in Guatemala where 83.6% of the men and 81.2% of the women performed all ADLs without difficulty. Men reported more difficulties with self-care activities whereas women had more mobility problems (Herman et al, 1998).

The ADL scale concerns the most basic personal self-care tasks whereas dimensions of mobility require greater physical effort. It was therefore in line with the expectations to find higher dependency levels in mobility. Only 5.1% of the Rwandan men and 8.7% of the women reported difficulties in walking 1 km, although 20% and 25% respectively had mobility problems as observed by the interviewers. Logically walking uphill was difficult for more people: 10.4% of the men and 15.9 % of the women needed help. In a large group of elderly from several developing countries, 24.3% could not walk 300 meters without assistance (Lamb, 1996) and in an Sri Lankan study 23% of the elderly had such difficulty (Fernando & Seneviratna, 1993).

<sup>7</sup> This scale included outdoor mobility.

<sup>8</sup> Including countries in north Africa, the Middle East and Asia.

Loss of independence also coincided predominantly with mobility problems in several other studies (SENECA Investigators, 1996b; Allain et al, 1997; Era & Rantanen, 1997; Dunlop et al, 1997). Further the current study confirmed findings from other countries (including developing countries) that dependence and functional decline are more likely to occur at more advanced age and in women (Dejene, 1995; Lamb, 1997, 1996; Chilima, 1998; Manandhar, 1999; Béland & Zunzunegui, 1999). These are probably effects of surviving longer with physical impairments.

### 8.5.2 Physical test performance

In this study, men performed better than women in the physical tests but not in the object recall test. Similar sex differences in physical performance were seen in other studies (Bassey et al, 1989a; Hyatt et al, 1990; Bassey & Harries, 1993; Watters et al, 1985; Liang & Chumlea, 1998). Better physical performance by men is common at all ages, but in older populations it may partly be ascribed to a higher occurrence of health problems in women, which may have reduced the level of customary physical activity. Poor health and reduced physical activity may also independently affect physical performance.

Handgrip strength is one of the most common physical tests and has been directly related to nutritional status. Refugee men had a mean value of 30.3 kg and women of 22.3 kg. The sex difference was not entirely explained by skeletal size; women had significantly lower strength per kg body weight ( $P < 0.001$ ). However the difference may not be present when strength is expressed per kg muscle mass as shown by Frontera et al, 1991). Grip strength values of only few developing country populations are available. Table 8.3 shows values of Rwandan refugees and people from urban India and rural Thailand and Malawi. Values in the Indian population are much lower than in the other three populations, which do not differ much from each other. It is possible that the differences between the African and the urban Indian population also reflect different lifestyles and occupational histories. The rural people were used to heavy agricultural work whereas the Indian slum dwellers had a variety of occupational backgrounds such as cotton mill worker, road cleaner or menial office worker (HAI & LSHTM, 1997). Varakamin et al (1998) also suggested that lifestyle may influence both body composition as well as muscular strength. This was based on a comparison between rural active elderly (data in table 8.3) and sedentary elderly living in a residential home in

Thailand. The institutionalised, who had access to better food and care, had higher body fat and lower handgrip strength. The three groups of rural elderly have very similar handgrip strengths.

The refugees' grip strength values were either below those of developed country populations or similar, particularly in women. As it is unlikely that elderly in developed countries were more active, this may be due to a poorer nutritional status of the refugees or may reflect the earlier onset of old age in developing countries. Based on an UK sample, Webb et al (1989) proposed lower limits of acceptable pre-operative grip strength for age and sex, based on the best combination of sensitivity and specificity. Grip strength values of the Rwandan refugees were at all ages below the suggested limits and men were 10-20% more below 'standard' than women. This would suggest that refugee women not only had a high arm muscle mass but also high grip strength compared to other women.

The prevalence of impaired handgrip (using the 25-percentile cut-off from the total sample) among kyphotic people was much higher than among non-kyphotic people. For women this was not entirely explained by the higher mean age in the kyphotic group, as the prevalence of functional impairment in the oldest non-kyphotic group ( $\geq 70$  years) was lower.



Table 8.3 Mean handgrip strength in developing and developed country populations

Country	n	Sex	Age (yrs)	Handgrip (kg)	SD	Reference
Rwanda	828	m	50-92	30.3	6.7	present study
rural refugees			50-59	32.9	6.6	
			60-69	29.0	5.7	
			≥70	26.2	6.0	
		f	50-92	22.3	5.1	
			50-59	23.9	5.0	
			60-69	21.6	4.6	Chilima (1998)
			≥70	19.0	4.3	
Malawi	284	m	55-94	28.0	5.9	
rural			55-59	32.3	5.5	
			60-69	29.0	6.1	
			≥70	25.9	5.2	
		f	55-94	21.7	4.5	
			55-59	22.9	4.0	Varakamin et al (1998)
			60-69	21.7	4.9	
			≥70	19.7	3.2	
Thailand	244-	m	60-69	31.4	7.8	
rural	280		70-79	25.0	6.3	
		f	60-69	22.6	4.7	
			70-79	19.7	4.5	Manandhar (1999)
India	1097	m	50-96	22.9	6.5	
urban			50-64	23.7	6.5	
			≥65	20.8	6.5	
		f	50-96	13.4	4.5	
			50-64	14.0	4.4	
			≥65	11.1	4.2	Bassey (1998)
UK	350	m	>65	37.2	8.1	
community-living		f	>65	21.6	5.9	Lehman & Bassey (1996)
UK	405	m	≥65	36.6		
community-living		f	≥65	21.3		Bassey & Harries (1993)
UK	920	m	>65	33.8	9.3	
community-living		f	>65	19.5	6.3	Skelton et al (1994)
UK	100	m	65-69	46.7	8.0	
healthy volunteers			70-74	40.2	5.0	
			75-79	37.1	5.0	
		f	65-69	26.0	3.0	Hyatt et al (1990)
			70-74	27.0	5.0	
			75-79	22.0	6.0	
UK	92	m	65-89	32.7	10.1	
ambulant, attending day care/day hospital		f	65-89	22.0	8.6	Suboticanec et al (1989)
Yugoslavia	100		65-80	48.1	3.4	
mobile, institutionalised						

Repeated chair stands measure both lower extremity muscle strength and endurance. In the Rwandan sample 12.4% of the men and 15.7% of the women were unable to rise five times from a chair. In a highly functioning American cohort aged 70 to 79 years, 51% completed this task in 12 seconds or less (Seeman et al, 1994). Of the Rwandan people (who were younger), only 36.8% managed within this time. However they performed better than another group of American community living people over 70 years: 14.8% of the men and 27.4% of the women did not complete five rises (Merrill et al, 1997). Elderly Europeans participating in the SENECA study (1996b) took a similar time as the refugees to complete five chair stands, but the Europeans were older (74-79 years). In older Chinese people living at home, men and younger people performed better in repeated chair stands than women and older people, and those engaged in regular exercise did better than the physically inactive (Liang & Chumlea, 1997). Differences in performance between populations may also be due to differences in prevalence of obesity that may be an impediment to chair rises and other tests.

A high BMI was found to be associated also with low shoulder range in women (Bassey, 1989b). It was assumed that fatty tissue may restrict range, particularly when muscle strength is low. Shoulder flexibility is relevant to self-care tasks such as bathing, dressing and grooming and certain household tasks e.g. carrying loads on the head. Shoulder rotations were unimpaired in 79.1% of the Rwandan men and 76.5% of the women. This compares to 84.2% for American men and 71.2% for women (Merrill et al, 1997). Of Sri Lankan elders, 69% managed an external shoulder rotation (Fernando & Seneviratna, 1993).

The present study showed poorer performance in all tests in each older age group with a more marked decrease above age 70. This is not only in agreement with cross-sectional studies in India and Malawi (Chilima, 1998; Manandhar, 1999), but also with longitudinal studies that found a significant decline with age in functional performance, even at an accelerating rate at more advanced age (Kallman et al, 1990; Grimby, 1995). Psychomotor speed, muscle strength and mobility were found to be predictive of survival especially in women (Era & Rantanen, 1997).

Cross-sectional studies tend to underestimate true age-related strength losses due to selective survivorship (Hurley, 1995). A large longitudinal study among older non-institutionalised Americans demonstrated a greater decline in physical function with age than suggested by cross-sectional studies. The rate of decline was higher at more advanced age and higher in women (Beckett et al, 1996). Bassey & Harries (1993) also found greater loss of handgrip strength over four years (3% per year for men, 5% per year for women) than predicted from baseline data.

## **8.6 Determinants of vulnerability**

### ***Limitations***

A major limitation of the multiple linear regression analysis was that the proportions of people with low BMI and who were dependent in ADLs were small. Higher proportions would probably have shown more convincing results. Further, there are possibly more confounders than those controlled for in this analysis.

### **8.6.1 Nutritional vulnerability**

Regression analyses were carried out with four different nutritional status indicators as dependent variables: BMI, AMA, MUAC and the sum of three skinfolds. Explained variances were always much higher in men than in women. The highest percentage explained variance was achieved in both sexes when AMA was used as nutritional status indicator: 26.4% in men and 19.5% in women. MUAC came second in both sexes, followed by BMI and skinfolds. Strickland & Ulijaszek (1994) who looked at ill health, also suggested that AMA (uncorrected) may be a more sensitive index rather than BMI. The order was not surprising since handgrip strength was used as an indicator of functional ability. As this is a measure of muscle strength in the hand and fore-arm, it is likely to explain variance in AMA best. MUAC measures both muscle and fat tissue in the arm and is therefore likely to yield higher explained variance in handgrip than BMI which measures these two components in the whole body. Consistent with this, higher correlations were found between handgrip and AMA, than with MUAC and BMI (table 7.11). Understandably the sum of skinfolds yielded the lowest explained variance in handgrip as it measures fat tissue in the arm, although the amount of fat and muscle tissue are also correlated.

Considering the determinants of low AMA, low MUAC and low BMI (excluding those with BMI > 25) in men simultaneously, three explanatory variables emerged for each nutritional status indicator in men: handgrip strength, diastolic blood pressure and smoking (table 7.14). The direction of the relationships indicates that men with poor nutritional status had lower handgrip strength, lower blood pressure and were likely to smoke. The fact that handgrip strength, a dimension of functional ability, is the strongest determinant of nutritional status independent of age, sex and health conditions is a relatively new finding among third world elderly and supportive to the hypothesis of this study. Chilima (1998) reported the same finding and also Manandhar et al (1997) demonstrated that low BMI in Indians significantly increased the risk of having low levels of some important dimensions of functional ability (handgrip strength, the ability to travel, bathe and dress), independent of age and sex. Galanos et al (1994) demonstrated that impaired functional status<sup>9</sup> of free-living older Americans was significantly related to both extremes of BMI, controlling for a range of variables including age, sex and self-reported health.

Many studies have already demonstrated a relationship between poor nutritional status and smoking in adults, suggesting that reduced appetite and higher metabolism play a role. This has recently been confirmed in the elderly. Older cigarette smokers were at risk of sub-optimal anti-oxidant plasma levels, and this could not entirely be explained by their lower intakes (Walmsley et al, 1999).

A relation between poor nutritional status and low diastolic blood pressure was seen in this sample. It is well known that increased fatness is related to hypertension (Tuomilehto et al, 1991). However it has also been reported that undernourished subjects have lower resting values for systolic and diastolic blood pressure (Jayarajan & Shetty, 1992). BMI was also positively correlated with systolic and diastolic blood pressure in middle aged Chinese adults of similar mean BMI as the refugees (Idema et al, 1998).

Regarding nutritional vulnerability in men, other determinants related to physical function were chair stand time, plate tapping time and mobility. Further there were engagement in

---

<sup>9</sup> Assessed by various scales based on self-report, totalling to 26 items.

paid labour and light household activities that can be considered indicators of physical activity and the former also of economic status. In addition, health-related variables emerged such as cognitive status, bleeding gums and constipation as well as socio-economic and food access variables such as being literate, receiving financial assistance and having a kitchen garden. Garcia & Kennedy (1994) also provided evidence from four developing countries that the proportion of underweight people increased as income decreased and that the prevalence of morbidity rose with age.

Men with a poor nutritional status were likely to be less mobile and not to be engaged in paid labour, which is consistent with the strong relation with reduced handgrip as an indicator of impaired physical function. However some determinants that emerged are hard to explain: poor nutritional status was related to a faster time in chair rises and plate tapping. Slower performance by heavy subjects due to excessive fat could have caused poor performance in the chair stand test (determinant of low AMA and MUAC). However this is no plausible explanation for the plate tapping test (determinant of low BMI), as those with BMI over 25 kg/m<sup>2</sup> were excluded. It is possible that poor motivation played a role. As mentioned, keeping up motivation was especially hard for these two tests. Payette et al (1998) found that lower extremity strength measured by the timed "up and go" test was not associated with fat free mass in frail free-living older women.

Men of poorer nutritional status were also likely to be engaged in light household activities. This does not conform to the traditional sexual division of labour, but observations and in-depth interviews clarified that traditional gender roles were often abandoned in the camp. Many families had lost members so there was less assistance available from relatives. For instance an older man married to a younger wife who was most of the time absent for work in local villages, would often have no choice but to help out at home. It may be possible that unfit men were unable to engage in heavy household tasks and paid labour, and therefore made themselves useful doing light activities in and around the house.

Easily bleeding gums in poorly nourished men could point towards a poor vitamin status. Although clinical signs of micro-nutrient deficiencies were rarely observed, it is possible that people who failed to supplement the food ration, suffered from sub-clinical

deficiencies. In a study among rural Guatemalan elderly, those with higher BMIs were more likely to have adequate blood parameters (King et al, 1997), and the proportion of anaemic people was higher among underweight people in India (Manandhar, 1999).

Moreover, men of poor nutritional status were more likely to be illiterate and less able to process and remember verbal information, which could have been an impediment to their income generating ability and hence to food availability. Although most study designs were cross-sectional, there are indications that adequate nutrient intake leads to better cognitive performance in older people (Goodwin et al, 1983; Ortega et al, 1997; Huijbregts et al, 1998). It must be noted that poor nutritional status may precede as well as result in impaired cognitive function. Furthermore poorly nourished men were likely to receive financial assistance from others which may be an indicator of low economic status. The relationship between poorer nutritional status and having access to a kitchen garden and absence of constipation are hard to explain. However the contribution of these variables explained less than 1% of the variance and they did not appear in the equations with corrected handgrip strength.

In women handgrip strength was also the strongest explanatory variable of all three nutritional status indicators (table 7.15). Other similarities with the male risk pattern occurred: rapid chair stands, low diastolic blood pressure and smoking were also related to poor nutritional status in women. The remainder of the picture was somewhat different, pointing towards gender differences in nutritional vulnerability in this sample.

In addition to handgrip strength, not being able to afford to offer a drink to guests and consumption of non-cereal staples minimally once a week, were related to poor nutritional status for all three indicators. Apparently older women with poor nutritional status were likely to be in great economic need, but at the same time they seemed to eat plantain, the favourite food, at least once a week (as opposed to seldom). In the first instance this seems contradictory. However they were also likely to eat only one meal per day, suffer from nausea, receive food as a gift and have no kitchen garden. Therefore a plausible explanation, supported by the life stories, is that they ate little food because they were poor and experienced nausea, but they did receive food from others. This food was

probably plantain, received from younger adults (children and, less often, neighbours or friends) who worked in local villages.

Further, women of poor nutritional status reported being in poor health and were likely to be kyphotic. These factors may represent an impediment to food acquisition, food intake or both. Kyphosis may be a manifestation of spinal osteoporosis (related to nutritional status) or decreased muscle strength (related to functional ability). In American community-living osteoporotic women, kyphosis was associated with back pain, poor self-reported health status and back-related disability (Ensrud et al, 1997). The fact that no difficulties in chewing emerged as a determinant of poor nutritional status may be attributed to a diet of mainly thin porridge that some elderly used to have. A puzzling finding was that women of poor nutritional status in this sample had better manual dexterity (rapid in lock & key test) and no arthritis.

As social support may buffer older people from the potential negative effects of functional impairment on food intake and diet, it was encouraging to notice that those in nutritional need indeed did receive food or money from others. Besides instrumental support, emotional support has been shown to contribute, either directly or indirectly, to better health which ultimately results in lower mortality (Shye et al, 1995; Penninx et al, 1997). From observations and interviews in the camp it was learned that, compared to the situation before the war, there was less solidarity among the Rwandan people. It occurred that people without tools or household equipment such as a hoe or laundry basin, had to hire these from others. It was said that this would never have happened in Rwanda and was blamed on poverty, frustration and bitterness. Apparently mutual relationships improved once the refugees were settled, with better general living standard. One can imagine that poor, older people would have experienced extreme severe conditions at the height of the emergency. Quite a number of people told us that they had been very ill and weak (often from dysentery) at that time and had never completely returned to their previous level of functioning.

Similar to men, smoking and blood pressure emerged in women as well as other health-related factors. However socio-economic factors emerged most frequently (inability to offer a drink and consumption of non-cereal staples). This could be related to the fact

that the proportion of widows was much larger than the proportion of widowers and widows were likely to be of poorer socio-economic status.

Regarding the sum of skinfolds as nutritional status indicator, the percentage of explained variance was lower than for the other three indicators and again higher in men than in women. Mainly health-related and socio-economic factors emerged as determinants of low fat reserve in older people (table 7.16). Among rural older Kenyans the socio-economic status index was also significantly higher among those with above average nutritional status (Waswa, 1988).

The physical capacity of short people tends to be less even when corrected for their smaller muscle mass (James & François, 1994). At similar BMIs, short people will be of lower body weight and have a lower maximum oxygen uptake. Therefore analyses with handgrip strength corrected for height as proxy for body and muscle size were also carried out. These gave very similar results to those with uncorrected handgrip as independent variable (table 7.14, 7.15 and 7.17). Table 8.4 provides an overview of the main differences and similarities in both sexes. Although one can argue whether height is an appropriate proxy for muscle size, there is a striking similarity in findings. Results even improved slightly with corrected handgrip strength emerging as a stronger predictor of nutritional status than ordinary handgrip. This means that persons with a low BMI have less strength relative to their muscle size.

Table 8.4 Differences and similarities with corrected handgrip as independent variable instead of ordinary handgrip

Men	Women
Same variables in equation	Lock & key test instead of arthritis
Total explained variance 1.4% higher	Total explained variance 0.8% higher
Explained variance by handgrip 1.5% higher	Explained variance by handgrip 1.0% higher
Greater regression coefficient ( $\beta$ ) for handgrip	Greater and more significant regression coefficient ( $\beta$ ) for handgrip

Vaz et al (1996) also found handgrip strength a useful nutritional status indicator, particularly to differentiate between the chronically undernourished and those who were underweight. Both groups had BMI < 18.5 kg/m<sup>2</sup> but the chronically undernourished were



of poor socio-economic status and short stature (probably indicative of undernutrition since childhood). Strength of the underweight individuals was comparable to normal weight subjects despite their significantly lower anthropometric indices, but was significantly higher than that of the chronically undernourished group even when corrected for stature and fore-arm muscle area.

Further, oedema and kyphosis may also need to be considered as risk factors for nutritional vulnerability. Oedematous people were older and among them, risk factors such as poor socio-economic status, poor health and food satisfaction, diminished handgrip strength, ADL dependence, impaired mobility and kyphosis were more often present. The prevalence of undernutrition among kyphotic people was much higher than among non-kyphotic people. Kyphosis restricts movements and, particularly in severe cases, can be a serious impediment to functional ability. In older community living Americans, kyphosis was found to be independently associated with diminished function, especially mobility (Ryan & Fried, 1997).

In summary this research has shown that among the variables entered in the equations, handgrip strength is the strongest determinant of nutritional vulnerability in this sample of older Rwandan refugees, independent of age, sex and health conditions. Similar results emerged from the urban Indian and rural Malawi sample (Chilima, 1998; Manandhar, 1999). This important finding indicates that older people who are in a poor nutritional status are likely to have more difficulties in functioning independently in the community and contradict the often heard argument that older people may either be thin because of chronic diseases or may be functioning well despite their slenderness. Whether poor nutritional status causes impaired functional ability cannot be concluded from this study, but the few longitudinal studies that have been carried out among various populations, do point to this direction.

Galanos et al (1994) reported that very low or high BMIs were still related to increased functional impairment 7 and 13 years later, controlling for relevant variables such as demography, cognition, depression, medical conditions and self-rated health. The relationship roughly fitted a U-shaped curve. In the Rwandan sample, we found indeed indications for a U-shaped curve between BMI and handgrip among women. Campbell et

al (1990) found a significantly increased risk of death after nearly 3½ years in community living men with a BMI under the 5<sup>th</sup> percentile. Both studies probably considered a wider range in nutritional status and the poor were over-sampled in Galanos' study. This raises the question whether socio-economic factors play a role or whether there would be a threshold beyond which weight loss has an impact on physical function? This question was addressed by Tully and Snowden (1995) who followed elderly nuns for 18 months. They reported a relative risk (adjusted for age and initial weight) of becoming dependent in each considered ADL that was 2-3 times greater for those with an annual weight loss of 3% or more. The unique setting of the study reduced the possibility that weight loss was affected by social, financial and psychological factors. An annual weight gain of 3% or more was associated with dependency in standing and (not significantly) walking.

Besides functional ability, variables that emerged as determinants of nutritional vulnerability were food and health related as well as socio-economic factors. Among rural elderly Malays, similar predictors of malnutrition (using BMI < 18.5 kg/m<sup>2</sup>, serum albumin and haemoglobin) and dietary inadequacy (≥ 4 nutrients below 2/3 RDA) were used, for which similar social and health related factors emerged (self-perceived weight loss, smoking, hypertension, economic dependency, number of regular meals per day, chewing ability, appetite, fruit consumption, respiratory disease and joint disease (Shahar et al. 1999)). Economic status has also been described as a crucial determinant of the nutritional status of older Javanese people. Older people's control of funds was a determinant of their BMI rather than the economic level of the household (Evans, 1990).

In a protracted refugee situation in the Sahara, individual indicators of nutritional vulnerability were hard to determine as there was a large degree of homogeneity in the population. However there were differences between households. The most informative and practical indicators to target vulnerable refugee households were: large household size, high dependency ratio, no ownership of convertible assets (livestock), use of contaminated water source and no access to health services (Branca, 1998). The first three indicators also characterised nutritionally vulnerable households in urban Bangladesh (Pryer, 1993).

In an analysis of an extensive data set including 9,000 adults aged 20 to 65 years from Ghana, BMI explained 16% of the variation in indicators of standards of living at the individual, household and community level. It was suggested that in low-income countries with a mean BMI between 20 and 23 kg/m<sup>2</sup>, BMI can be considered as an indicator of standards of living (Nube et al, 1998).

Similarities in reported risk factors for undernutrition can even be seen when comparing with older people in developed countries. Among older community-dwelling Americans 15.5% of the men and 27.1% of the women were at nutritional risk according to the Nutrition Screening Initiative checklist (Sahyoun et al, 1997). Eating alone, difficulties biting and chewing, difficulties in shopping and cooking, and taking more than three medications per day were all significantly associated with mortality at follow-up. Similar problems prevailed among two samples of inner-city-dwelling older black Americans assessed with the same tool. A higher proportion was at nutritional risk (48% and 66%), particularly those with a high number of depressive symptoms, poor self-rated health and - most important - of low income, indicating the crucial role of poverty in nutritional vulnerability (Miller et al, 1996).

Research among community dwelling elderly in and around Nottingham investigated the relationship between poor nutritional status measured as weight divided by demispan (mindex) and socio-economic, psycho-social, physical and socio-demographic variables that had previously been determined as potential constraints to food choice. In the latter two categories, the variables - increasing age, being female, living in an urban area, smoking and poor appetite - proved to be the best predictors of low mindex and together explained 16.8% of the variance. Based on the bivariate analysis it was suggested that urbanicity as such was probably not a risk factor for poor nutritional status, but rather represented the worse socio-economic and psycho-social situation (low income, low educational attainment, living alone, inability to carry the shopping, lower social engagement and life satisfaction) of the urban part of the sample (Donkin et al, 1998).

Two American studies were comparable to the previous survey in Nottingham regarding the large number of community living elderly and inclusion of a wide range of variables. Posner et al (1994) used a dietary variable as dependent variable, and the results were

remarkably similar, with increasing age, being female, smoking, living alone, low educational status and dental problems identified as predictors of inadequate intake of five essential nutrients. Reuben et al (1997) analysed NHANES I data that only covered an age range from 55 to 74 years. Predictors of hypo-albuminemia were amongst others old age, low socio-economic status, poor health, difficulties chewing, vomiting and smoking.

### 8.7 Qualitative data

Qualitative data provided valuable information that helped explain the basis for the findings. The group discussions and in-depth interviews worked very well and were often lively discussions. People enjoyed talking and receiving attention. Apart from minor differences, the groups defined vulnerability according to the following main criteria:

1. Physical impairment.
2. No purchasing power, income, tools and utensils.
3. No support from other people.

These aspects were also brought forward as essential in life by individuals interviewed in-depth. The fact that physical impairment ranked first indicates that independence was valued highest with regard to well-being. Main problems faced by rural elderly in Botswana as brought forward in focus group discussions were very similar, with physical impairment ranking third: poverty, negligence by their children and illness and disability (Ngome, 1994).

The criteria were translated into the following main groups of vulnerable people:

1. The (physically) impaired such as the old and (mentally) disabled.
2. People in need of support such as unaccompanied elderly and children, and those with disproportionate caring responsibilities such as lone parents with young children and old people caring for orphans.

There seemed to be subtle differences in men's and women's perceptions of well-being. Economic independence was emphasised by men and receiving support by women. A similar difference was found among elderly Mozambican refugees (Heslop, 1995). This may be an expression of gender differences in vulnerability: compared to men, women's role is generally in the domestic rather than the public domain, and women have fewer income

generating opportunities. Therefore women are bound to be more dependent on others and assistance is a crucial condition for their well-being. The precarious situation of older women has been recognised elsewhere (Apt, 1990; UN, 1994; Oranga, 1997).

Different explanations by the widows and the very old group may perhaps be attributed to different gender roles as men were more talkative in the old group. Although both groups valued the ability to do agricultural work, widows added the ability to perform household tasks whereas the old complained about the continued necessity to contribute according to one's ability. The old group expected to be looked after unconditionally, whereas the widows were annoyed they were no longer able to work, particularly at home. Perhaps women continue to feel responsible for household work irrespective of age, as this has always been their task. Men's work used to be principally outside the household, which may explain why they feel comfortable being idle at home once they are unable to perform heavy work. Catell (1990) described rural Kenyans' ideal view of old age as a time of being rewarded for having met one's responsibilities and receive gifts, money and services, particularly from children. When older people are no longer able to work they should be able to "just sit and eat", in other words to be looked after by their children.

Daughters were reported to look after old parents better than sons. The same comment was made by the elderly in Botswana (Ngome, 1994). The quantitative analysis showed that an almost equal proportion of older people received care when ill from daughters as from sons. Care as discussed in the groups was however broader, including visits and gifts (food and money). It was expected that women would be more vulnerable to be blamed of witchcraft and expelled from the community, however such indications were not found.

Diminished respect is a reality in the lives of older refugees as became apparent from both group discussions and in-depth interviews. Dispossession, poor economic status and loss of control over strategic resources seem the main causes. This was also suggested by others (Mupedziswa, 1989; Rwezaura, 1989; Evans, 1990; pers.com. Pottier, 1995). Irrespective of the underlying reasons, it threatens older people's quality of life and increases their vulnerability.

### 8.8 Vulnerability of older refugees: determinants and interventions

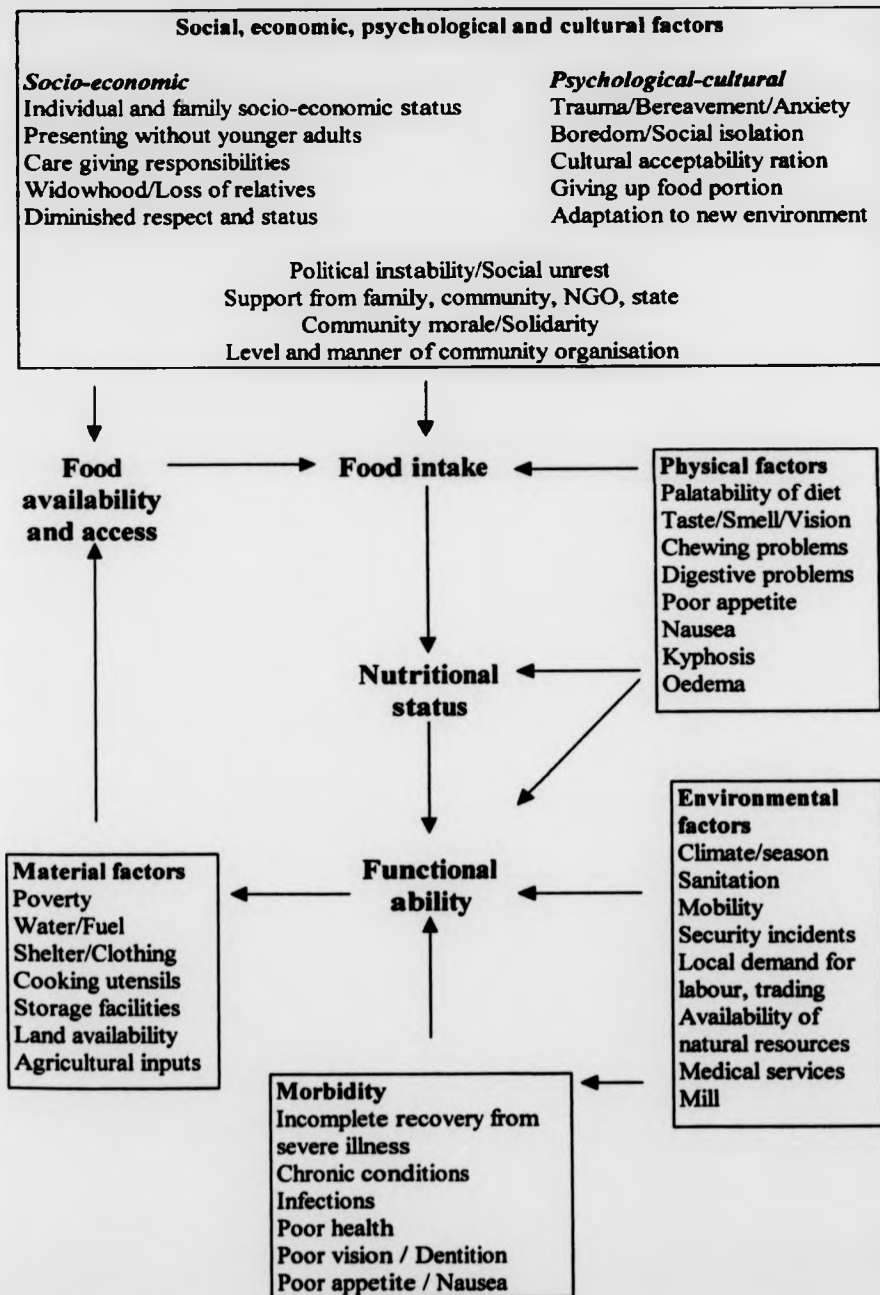
Based on the study population, this section brings together from the entire thesis a description of determinants of and processes leading to vulnerability of older refugees, leading to proposals for possible interventions. To facilitate the discussion, figure 4.1 was refined based on vulnerability determinants emerging from this study as shown in figure 8.1. For reasons of simplicity the structure of the model was not essentially changed. However the model is no more than a visual aid: it is impossible to show all relations and some determinants appear in several places. It will be indicated in the text how determinants are specific to older refugees.

#### *Determinants*

In this study population poor nutritional status was more prevalent above the age of 60 years. It emerged that BMI and MUAC can be used as anthropometric indicators of nutritional status in older refugees. A MUAC cut-off of 21.7 cm could be used in the acute emergency phase to identify extremely vulnerable individuals, whereas  $BMI < 18.5 \text{ kg/m}^2$  can be used in the post-emergency phase for a more general vulnerability screening.

Results of this study showed that those with poor nutritional status were more likely to be functionally impaired. This particularly referred to low handgrip strength, both absolutely and relative to body size. Functional ability generally decreases with age. However the maintenance of functional ability in terms of strength and mobility, is essential for older refugees as it determines their capacity to care for themselves and to be productive in terms of food production, foraging or income generation. Physical factors such as kyphosis and oedema influence nutritional status directly, but also impair functional ability most obviously through restricted mobility.

Figure 8.1 Determinants of vulnerability of older refugees



Functional ability is itself influenced by factors such as morbidity and the environment. In this population, many older refugees became severely ill during the acute phase of the emergency and never completely recovered to their previous level of functioning. Hence they remained impaired in terms of working capacity and general health, and sometimes also remained in a poor anthropometric status. Older people in this sample suffered from chronic conditions such as poor dentition, joint pain, high blood pressure and poor vision that may directly affect food intake or reduce the ability to acquire and prepare food. This also applies to poor appetite and nausea that were frequent health complaints, possibly due to worms, although these could also be caused by aversion to the diet or metabolic changes. Further older people are more susceptible to infections.

Environmental factors such as low temperatures, humidity and wind in combination with inadequate shelter and clothing contributed to infections in older people as they are more vulnerable to the effects of cold. Strong winds also caused damage to shelters which was a problem for older people who did not have support. The level of sanitation in the camp (water quantity and quality, drainages, latrines, sanitation behaviour) will also influence the incidence of infections among older people.

Apart from the individual level, mobility should also be considered at the population level. Restricted mobility imposed by authorities directly limits the refugees' survival strategies and seemed to have an immediate impact on the nutritional status of adults (e.g. at the time of the Tanzanian elections). However mobility may also be restricted by security incidents. These will frighten weaker people such as the elderly in the first place, but also affect them indirectly as younger people will not be willing to, for instance, collect fire wood for them. Other environmental factors that may facilitate independent living are the local demand for labour and competition with younger labourers, local trading opportunities, the availability of water, fire wood, land and raw materials for occupational activities. More confined to camp boundaries are availability of medical services and milling facilities (distance, waiting time, costs).

Apart from the physical ability to work, acquisition of food and other necessities depend on material factors. In cases of poverty, utensils, tools, seeds, adequate shelter (both for human protection and food storage) and clothing (also important for older people's dignity) will be lacking. Poverty is usually widespread among refugees, but as older



people are generally physically weaker and less mobile and educated, they have fewer opportunities to improve their economic status. As shown in this study, borrowing tools and utensils from others may be difficult if solidarity and community morale are low. Further, access to kitchen gardens or communal gardens in the camp or land to cultivate outside the camp is crucial. As mentioned before, distance and queuing times for water, food and the mill may determine usage by older people. Improved cooking stoves will be particularly beneficial to older people as they have most difficulties collecting fire wood.

For older people who are in general more dependent, social, material and financial support are often crucial whether it comes from relatives, neighbours, the community (e.g. church) or NGOs. In the current situation NGO support for older people was good, due to the presence of HAI. Older people living without younger adults or who have no children are particularly vulnerable with regard to support. Of these, those with care giving responsibilities (e.g. for orphans) are even more vulnerable as the dependency rate of their household and therefore the economic pressure is likely to be greater. The level of support will depend especially on the number of accessible relatives and friends (most refugees will have lost many of them) and their capacity and willingness to provide support. Poverty and famine will limit traditional caring systems to nuclear families where the elderly may be pushed out. Further, the level of received support will depend on the socio-economic status of the older person. Older people often complain about a deteriorating social status, which is related to widowhood, economic dependency and loss of control over strategic resources. Older refugees are particularly vulnerable with regard to diminished respect as the loss of property (land, houses, farms) leaves them without inheritance. Moreover elders as traditional leaders are often replaced by those who are powerful in the new situation: young armed men and aid organisations.

Older people are also likely to be less able to adapt to the new environment and harsh living conditions. This may be due to physical problems but also to less mental flexibility. Many are anxious about dying in exile, and suffer from trauma and bereavement. Boredom and social isolation was a typical concern of older refugees in this population. At home there was always something to do even for impaired elderly and there were more people around. In the refugee situation there was often no land (nearby) to

cultivate, no materials available for occupational activities, and younger people were mostly away for work or collection of wood or water.

The low cultural acceptability of the ration, unfamiliarity with ration items and limited access to preferred food were problems, and may have contributed to poor appetite, nausea and feelings of "psychological malnourishment" among older refugees. Chewing whole grain maize was especially difficult for older people with poor dentition. This in combination with other food and non-food needs, led to exchange and selling of ration items that generally resulted in a reduced energy value and low food diversity. It also occurred that older refugees gave up their portion in times of food shortage.

#### *Screening and interventions*

From the preceding discussion, it emerges that the determinants of nutritional vulnerability can probably be sought among the following factors: anthropometric status, functional ability, clinical signs, mobility, health, access to food, socio-economic status and support. In this section more specific risk indicators will be considered that proved to be of value in this sample. However they may not necessarily be appropriate for other populations. The advantages and disadvantages of their use will be described as well as their sensitivity and specificity in identifying poor nutritional status (see table 8.5).

Table 8.5 Sensitivity and specificity of risk indicators in identifying poor nutritional status (BMI < 18.5 kg/m<sup>2</sup>)

Risk indicators	Sensitivity (%)	Specificity (%)
MUAC < 21.7 cm <sup>†</sup>	85.7	97.9
Kyphosis	10.4	96.8
Oedema <sup>‡</sup>	9.1	93.3
Handgrip strength	29.9	80.3
Doing paid labour	82.7	31.6
Mobility	21.6	77.7
Poor health	13.4	88.1
Eating enough	69.2	39.9
Consumption of non-cereal staples	58.6	36.9
Receiving food	80.5	78.2
Receiving money	82.7	82.8
Presenting without younger adults	3.0	95.8
Ability to offer drink	68.9	39.6

<sup>†</sup> Sensitivity and specificity refer to BMI < 16 kg/m<sup>2</sup>

<sup>‡</sup> Sensitivity and specificity refer to MUAC < 23.7 cm

The best MUAC cut-off to identify poor nutritional status in this sample was 21.7 cm. The advantage of the MUAC measurement is that it is easier and quicker than the BMI measurement, it requires less sophisticated and less expensive equipment and it involves no calculations. Moreover the MUAC measurement can be obtained from kyphotic people and even from individuals with oedema if this is mild and only occurs in the legs. MUAC's sensitivity of 70.9% at a BMI of 18.5 kg/m<sup>2</sup> was reasonable but improved considerably to 85.7% at BMI 16 kg/m<sup>2</sup> although that included only few subjects. The disadvantage of the MUAC measurement compared to BMI is that it only provides information on one part of the body: differences in body fat distribution or in occupation (manual or otherwise) may lead to differences in MUAC that do not mirror real differences in nutritional status. BMI cut-offs are also better established and tested. However, there continues to be considerable debate about the validity of the BMI cut-offs for certain populations for instance nilotic people.

Apart from an indicator of risk, an indicator of benefit also needs to be identified to be able to monitor response to interventions. Aid organisations have reported problems with anthropometric discharge criteria as elderly in nutrition programmes seldom recovered their body weight. Nevertheless nutritional support has been reported to be beneficial in clinical studies (Delmi et al, 1990; Chandra, 1992; Abbasi et al, 1994; Castaneda et al, 1995; Rush, 1997).

Clinical signs may point at enhanced risk of poor nutritional status. Clinical signs of nutrient deficiencies were not observed in this sample, but kyphosis and oedema seemed to be associated with a higher prevalence of undernutrition and both conditions are likely to impede mobility. A problem is that it may be difficult to detect and objectively judge these conditions visually, particularly when they are very minor. In the case of kyphosis, guidelines for diagnosis do not even exist. Kyphosis and oedema did not prove to be very sensitive screening tools (10.4% and 9.1% respectively), although this may also be due to the low prevalence in this sample.

Impaired functional ability is also a risk factor for undernutrition as it is likely to reduce working capacity and mobility. Handgrip strength proved to be the most discriminating physical test in this sample. Its sensitivity of 29.9% is not high, but increased at lower BMIs (57.1% at BMI 16 kg/m<sup>2</sup>). Although a measurement of handgrip can be obtained easily and quickly from experienced subjects, explaining the procedure and repeating measurements will be time consuming. Moreover the equipment is delicate and expensive and cut-offs do not exist.

Not being able to do paid labour, poor health and reduced mobility can also be considered as dimensions of impaired health and function that involve risk to undernutrition by reducing a person's ability to acquire food. The sensitivity of paid labour is remarkably high (82.7%). In contrast to most other risk indicators, specificity is much lower than sensitivity which may be due to the fact that doing paid labour was probably underreported. Mobility and poor health are less sensitive risk indicators (21.6% and 13.4% respectively). Both conditions are hard to judge and very subjective.

A subjective indicator of actual food intake in this sample was a self reported measure of eating sufficiently that has a reasonable sensitivity of 69.2%. Consumption of non-cereal staples may be an indicator of food diversity in this refugee sample, but is more likely to be an indicator of access to food through support and/or socio-economic status. Its sensitivity is reasonable (58.6%). The sensitivity of other indicators of support such as receiving food or money are higher: 80.5 and 82.7% respectively. Presenting without younger adults is definitely a risk factor for the nutritional situation of older refugees. However its sensitivity is very low which is probably due to the small numbers. The ability to offer a drink seemed a reasonable indicator of socio-economic status in this sample, although its sensitivity of 68.9% is not very high.

Developing a screening tool depends on the purpose of screening the elderly population. In order to mitigate the effects of vulnerability, relevant interventions may be therapeutic and supplementary feeding programmes and support programmes (material, physical, social). Medical and nutritional support is proposed for extremely vulnerable elderly with the ultimate view to preserving their function. Screening for entry into therapeutic and supplementary feeding programmes is most likely for the acute phase and entry into the supplementary feeding and (social) support programmes would be more appropriate for the rehabilitation phase. Based on the results of this study, the following screening tool is proposed (table 8.6).

Table 8.6 Proposed screening tool

Therapeutic feeding	
Admission criteria:	Discharge criteria:
BMI<16 / MUAC<21.7 cm <i>or</i> clinical signs of deficiencies <i>or</i> severe illness/acute inability to walk	BMI≥16 / MUAC≥21.7 cm <i>and</i> no clinical signs of deficiencies <i>and</i> recovery from illness/ability to walk
Supplementary feeding	
BMI<16 / MUAC<21.7 cm <i>or</i> BMI<18.5 / MUAC<23.7 cm <i>and</i> no support <i>or</i> illness <i>or</i> poor mobility <i>or</i> oedema <i>or</i> kyphosis	BMI≥18.5 / MUAC≥23.7 cm <i>or</i> BMI≥16 / MUAC≥21.7 cm <i>and</i> support available <i>and</i> no illness
Support programme	
no anthropometric problems but presence of risk indicators from table 8.5	absence of risk indicators

The first choice should be BMI as it provides information about the entire body (equivalent cut-offs of 16 and 18.5), but MUAC can be substituted for the sake of speed, cost and simplicity. It must be emphasised that this is a potential screening tool that would have to be field-tested, especially in relation to the feeding programmes in the acute phase as this research was conducted only in the rehabilitation phase. Progress in a feeding programme could be monitored by regularly checking the clinical state and the individual's weight. Taking into consideration the experiences of some NGOs with changes in anthropometric status in response to feeding, anthropometric discharge criteria may need to be given less importance than clinical and social criteria.

Entry for support programmes should be based on the presence of one or more risk indicators selected from table 8.5. This should be based on the local context and even the risk indicators themselves may need to be adapted. Social support programmes could include home visits, mutual support groups and productive group activities such as gardening and occupational activities. They should as much as possible be carried out by

the elderly themselves and the rest of the community. Involvement of the community will be hard during the initial phase of the emergency but attempts to do so must be started as early as possible.

On a more general level, aid organisations should collect age- and sex-specific data, assist in family tracing and make special efforts to keep households and other groups together. Organisations should be made aware of the problems of older refugees and make sure their services are accessible to them. Regarding food, it is recommended to include fortified items in the ration as older refugees are likely to depend exclusively on distributed food and hence are vulnerable to micronutrient deficiencies. It is preferable to set up a food distribution system to groups from the beginning, but if this is not feasible, older people should be given priority in all queues (food, non-food items, mill, water medical services). Access must be given to some land if possible.

Aid organisations can facilitate an active community role for older people by employing elderly people, promoting the elderly as community leaders, and training older refugees to take up specific community tasks. Communication with the community of older people may be facilitated by promotion of the election of leaders. Aid organisations can act as an intermediate in negotiations between the refugee community and the local population thus increasing access to land or other resources and reducing security incidents.

## **9. Conclusions and recommendations**

### **9.1 Conclusions**

Undernutrition in older people is difficult to recognise and quantify due to our limited understanding of age-related changes in body composition. Nevertheless this study showed significant relations between low anthropometric values and indicators of poor functional ability, health, food access and socio-economic status, suggesting that low anthropometric values do have functional significance.

The research demonstrated that even in a self-selected population of relatively fit older Rwandans who managed to reach the camp and survive in exile for more than a year, undernutrition was prevalent, particularly at advanced age and among kyphotic people. Also AMA, which is known to be associated to muscle strength, was significantly lower in older age groups. Thinness and significant unintentional weight loss in older people is reason for concern and must be addressed as it affects general health and functional ability, and is hard to reverse without special attention.

A number of disadvantageous conditions such as poor health, widowhood and poverty were significantly associated with being older and female, indicating particular vulnerability of women and the oldest old. The most crucial period was the flight and subsequent chaotic initial stage in the camp when morbidity and mortality rates were high. During the acute emergency phase many older people had become severely ill, lost weight and subsequently had difficulties returning to their previous level of functioning.

While assessing undernutrition in older people by anthropometry, using BMI is problematic if a reliable height measurement cannot be obtained. However armspan (or halfspan multiplied by two) was shown to be a practical alternative. The application of armspan in the BMI equation is still limited due to absence of population-specific data relating armspan to height. Also MUAC seems a potentially useful measurement, particularly in unstable situations when there is time pressure and few resources. However, using cut-offs proposed for younger adults, MUAC identified far fewer undernourished than BMI. There is an urgent need for BMI and MUAC cut-offs to classify undernutrition in older people. Cut-offs for younger adults may not be



appropriate for the elderly, particularly over 70 years of age. Cut-offs for both BMI and MUAC may even need to be age- and region- specific.

This elderly sample was still involved in various activities of which gardening and cultivation were favourites. Older people valued their physical independence and ability to engage in activities. Dependence in basic activities of daily living was very low. Impaired functional ability, as measured by physical tests and mobility assessment, was significantly more prevalent in women and older age groups and predominantly comprised mobility problems. Mobility is an important attribute in refugee camps where people are not self-sufficient and caring behaviour is often diminished. Impaired handgrip strength was strongly related to poor nutritional status using various nutritional status indicators. Individuals with poor nutritional status had an almost double risk of impaired handgrip compared to those with adequate nutritional status.

In the multiple regression analysis, impaired handgrip strength proved to be the most important determinant of nutritional vulnerability independent of age, sex and health conditions. People of poor nutritional status even had less handgrip strength relative to their body size, which is presumably due to undernutrition. Other significant determinants were socio-economic, food and health related variables. Socio-economic variables prevailed in women, whereas health related variables dominated in men. Older people themselves defined vulnerability as encompassing the following: physical impairment, lack of purchasing power, and lack of support. Women's emphasis on support reflected their greater economic and social dependence. In agreement with the quantitative data, the qualitative data also highlighted the precarious situation of women and the oldest old. The results support the hypothesis that socio-economic conditions, health, food access and functional ability are associated with the nutritional status of older refugees. A screening tool for entry into feeding or (social) support programmes is proposed based on anthropometric, clinical and social criteria.

The main conclusion from this research is that older people who are in a poor nutritional status are likely to have more difficulties in functioning independently in the community than those with better nutritional status. This adversely affects the quality of life since independence and good physical ability is older people's main criteria of well-

being. Therefore it is essential that older people remain in good nutritional and general health condition for as long as possible. Especially in unstable situations where many young adults may have died and families have split, independent older people still have an active role to play in family life and well-being, and also beyond that in the wider community.

## **9.2 Recommendations**

Recommendations to reduce the nutritional vulnerability of older refugees include awareness raising regarding risk factors for undernutrition in older people and vulnerability assessment, and interventions such as improvement of older people's access to an adequate and appropriate diet. In view of the growing numbers of older people in prolonged emergencies in the world and their relative vulnerability, this topic should receive more attention.

### **Recommendations addressed to NGOs and UN agencies working in emergency situations:**

Anthropometry is a useful tool to help identify nutritionally vulnerable elderly. Armspan can be used as a proxy for height, but population-specific equations need to be developed. In view of the lack of such data, its practical application in the near future will remain limited. The use of MUAC in unstable situations also seems valuable, but age- and population-specific cut-offs are needed.

Age- and sex-segregated data should be collected (by existing surveillance systems) to provide a picture of the nature and magnitude of the problems in a particular situation, and also for monitoring and evaluation purposes.

In an emergency situation vulnerable older refugees should be systematically identified as soon as possible. In addition to anthropometric measurements, physical, social, economic and psychological criteria may be used. If possible their situation should be monitored to detect changes over time. More information regarding screening criteria and experiences should be tested and the results made available.

Efforts should be made to trace family members or friends of unaccompanied older refugees.

Community and family members should be encouraged and helped to look after older people.

Involvement of older refugees in community activities should be encouraged by making use of their skills e.g. in productive activities, passing on knowledge and looking after other elderly, children or anyone else in need. A good example from Tanzania was the involvement of older women in camp committees working against sexual harassment.

Opportunities to maintain respect, dignity and traditional social structures need to be given to older refugees by involving them in productive activities and decision making processes that affect their status in the family and in the community.

Special needs of vulnerable older people should be recognised and as much as possible be addressed in the family or community (e.g. regarding psycho-social issues, food, materials, health, access to services, information/knowledge). If special services for older people are desirable, they should be integrated in the general assistance programme to prevent isolation resulting from visibly targeted interventions. An example is food distribution to groups that was appreciated by refugees in Tanzania.

Regarding the food ration, the cultural acceptability and macro- and micronutrient needs should be considered.

Given that relief efforts will never wholly satisfy food needs directly, adaptive strategies of refugees should be accepted as legitimate despite possible political sensitivity. UN agencies should act as mediator between the refugee and local community to prevent tension.

In case feeding programmes are deemed necessary, it should as much as possible go hand in hand with activities that promote community support for older people. An

example is the dry supplementary ration for older people given out by a medical aid organisation and delivered and monitored by HAI's homevisitors.

Advocacy is important to raise awareness and commitment among refugees themselves as well as among aid organisations. It may take place by challenging community norms and awareness raising in the refugee community and among aid agencies and policy makers. Preventive aspects of undernutrition should be emphasised.

It should be realised that the most vulnerable older people may have stayed at home or be displaced within their country. They need to be specifically included in programmes of agencies working in the home country, either in relief or rehabilitation, as early as possible.

**Recommendations for future research:**

There is a need for more longitudinal studies regarding the effects of ageing on nutritional status (nutritional status assessment and the relation with morbidity and mortality, role of muscle mass and strength).

More work should be done on age- and population-specific BMI and MUAC cut-offs.

There is a need for data on the relationship between armspan and height in other ethnic groups and age groups.

The use of AMA versus calf circumference as nutritional status indicators (specifically muscle) should be investigated.

Guidelines for the assessment of kyphosis should be developed including the degree to which kyphosis invalidates the height measurement.

Studies regarding undernutrition in older refugees should also be carried out in the acute emergency phase.

Qualitative and quantitative operational research is needed, including trial interventions addressing:

- the appropriateness of the proposed screening tools for therapeutic and supplementary feeding programmes;
- the appropriateness of the proposed cut-offs;
- the nature of therapeutic and supplementary feeding programmes for older people;
- requirements of older people with a view to improving rations;
- sub-clinical vitamin and mineral deficiencies in older people;
- existing social network and support systems and suitable support programmes.

The proposed screening tool should be tested in both acute emergency and rehabilitation phases.

More research is needed to develop screening tools for other locations and populations.

## References

- Abbasi AA, Rudman D. Undernutrition in the nursing home: prevalence, consequences, causes and prevention. *Nutr Reviews* 1994;52:113-122.
- Allain TJ, Wilson AO, Gomo ZAR, Mushangi E, Senzanje B, Adamchak DJ, Matenga JA. Morbidity and disability in elderly Zimbabweans. *Age & Ageing* 1997;26:115-121.
- Allen SC. The relation between height, armspan and forced expiratory volume in elderly women. *Age & Ageing* 1989;18:113-116.
- Altman DG. *Practical statistics for medical research*. London: Chapman and Hall, 1991.
- Anderson MB, Woodrow PJ. Reducing vulnerability to drought and famine: development approaches to relief. *Disasters* 1991;15:43-54.
- Anderson RT, James MK, Miller ME, Worley AS, Longino Jr CF. The timing of change: patterns in transitions in functional status among elderly persons. *J Gerontol Soc Sci* 1998;53B:S17-S27.
- Andrews G, Clark MJ. The International Year of Older Persons: putting ageing research onto the political agenda. *J Gerontol* 1999;54B:P7-P10.
- Anklesaria PS. *Comprehensive biomedical assessment of the urban elderly people*. Ph.D. Thesis, University of Bombay, 1995.
- Annan K. Address at ceremony launching the International Year of Older Persons (1999). *J Gerontol* 1999;54B:P5-P6.
- Antilla S. Functional capacity in two elderly populations aged 75 years or over: comparisons at 10 years' interval. *J Clin Epidemiol* 1991;44:1181-1186.
- Apt NA. The role of the family in the care of the elderly in developing countries. In: Kane RL, Evans JG, eds. *Improving the health of older people, a world review*. Oxford: J.D. Macfayden, Oxford University Press, 1990.
- Apt NA. Care of the elderly in Ghana: an emerging issue. *J Cross-cult Gerontol* 1993;8:301-312.
- Aspray TJ, Prentice A, James OFW. The nutritional status of elderly rural Gambians. Communications to the spring meeting of the British Geriatric Society, April 1994, Norwich. *Age & Ageing* 1994;23:46.
- Astrand P-O. Physical activity and fitness. *Am J Clin Nutr* 1992;55:1231S-1236S.
- Barac-Nieto M, Spurr G. Body composition in chronic undernutrition. *Am J Clin Nutr* 1978;31:23-40.

Barker JC. Health and functional status of the elderly in a Polynesian population. *J Cross Cult Geront* 1989;4:163-194.

Bassey EJ. Demi-span as a measure of skeletal size. *Ann Hum Biol* 1986;13:499-502.

Bassey EJ, Ebrahim SBJ, Dallosso HM, Morgan K. Normal values for range of shoulder abduction in men and women aged over 65 years. *Ann Hum Biol* 1989a;16:249-257.

Bassey EJ, Morgan K, Dallosso HM, Ebrahim SBJ. Flexibility of the shoulder joint measured as range of abduction in a large representative sample of men and women over 65 years of age. *Eur J Appl Physiol* 1989b;58:353-360.

Bassey EJ. Simple performance tests. In: Collins KJ ed. *Handbook of methods for the measurement of work performance, physical fitness and energy expenditure in tropical populations*. International Union of Biological Sciences, Medical Research Council and London School of Hygiene and Tropical Medicine, London: 1990.

Bassey EJ. Longitudinal changes in selected physical capabilities: muscle strength, flexibility and body size. *Age & Ageing* 1998;27-S3;12-16.

Bassey EJ, Fiatarone MA, O'Neill EF, Kelly M, Evans WJ. Leg extension power and functional performance in very old men and women. *Clin Science* 1992;82:321-327.

Bassey EJ, Harries UJ. Normal values for handgrip strength in 920 men and women aged over 65 years, and longitudinal changes over 4 years in 620 survivors. *Clin Science* 1993;84:331-337.

Baumgartner RN, Stauber PM, McHugh D, Koehler KM, Garry PJ. Cross-sectional age differences in body composition in persons 60+ years of age. *J Gerontol* 1995;50A:M307-M316.

Beckett AB, Brock DB, Lemke JH, Mendes de Leon CF, Guralnik JM, Fillenbaum GG, Branch LG, Wetle TT, Evans DA. Analysis of change in self-reported physical function among older persons in four population studies. *Am J Epidemiol* 1996;143:766-778.

Béland F, Zunzunegui MV. Predictors of functional status in older people living at home. *Age & Ageing* 1999;28:153-159.

Benjamin B. Demographic aspects of ageing. *Ann Hum Biol* 1989;16:185-235.

Bemben MG, Massey BH, Bemben DA, Boileau RA, Misner JE. Age-related variability in body composition methods for assessment of percent fat and fat-free mass in men aged 20-74 years. *Age & Ageing* 1998;27:147-153.



Berkman CS, Gurland BJ. The relationship among income, other socioeconomic indicators, and functional level in older persons. *J Aging & Health* 1998;10:81-98.

Bernard SL, Kincade JE, Konrad TR, Arcury TA, Rabiner DJ, Woomert A, DeFries GH, Ory MG. Predicting mortality from community surveys of older adults: the importance of self-rated functional ability. *J Gerontol* 1997;52B:S155-S163.

Berry-Koch A, Moench R, Hakewill P, Dualeh M. Allevation of nutritional deficiency diseases in refugees. *Food Nutr Bull* 1990;12:106-112.

Bisshop CW, Bowen PE, Ritchey SJ. Norms for nutritional assessment of American adults by upper arm anthropometry. *Am J Clin Nutr* 1981;34:2530-2539.

Borkan GA, Huus DE, Glynn RJ. Role of longitudinal change and secular trend in age differences in male body dimensions. *Hum Biol* 1983;55:629-641.

Bowling A. *Measuring health. A review of quality of life measurement scales*. Philadelphia: Open University Press, 1991.

Bowman B, Rosenberg I. Assessment of nutritional status of the elderly. *Am J Clin Nutr* 1982;35:1142-1151.

Branca F. *The nutritional status and nutritional vulnerability of Saharawi refugees*. Unpublished report: WHO, 1998.

Branch LG, Meyers AR. Assessing physical function in the elderly. *Clinics in Geriatric Medicine* 1987;3:29-51.

Brown M, Sinacore DR, Host HH. The relationship of strength to function in the older adult. *J Gerontol* 1995;50A:55-59.

Bruun FJ. There is no respect! Modernisation and the changing status of elderly men. In: Bruun FJ, Mugabe M, Coombes Y ed. *The situation of the elderly in Botswana. Proceedings from an international workshop*. Oslo: NIR-SUM, 1994.

Bryman A, Cramer D. *Quantitative data analysis for social scientists*. (revised edition) London: Routledge, 1994.

Burkholder BT, Toole MJ. Evolution of complex disasters. *Lancet* 1995;346:1012-15.

Campbell AJ, Spears GFS, Brown JS, Busby WJ, Borrie MJ. Anthropometric measurements as predictors of mortality in a community aged 70 years and over. *Age & Ageing* 1990;19:131-135.

Carmelli D, McElroy MR, Rosenman RH. Longitudinal changes in fat distribution in the Western Collaborative Group Study: a 23-year follow-up. *Internat J Obesity* 1991;15:67-74.

Casper RC. Nutrition and its relationship to aging. *Experimental Gerontology* 1995;30:299-314.

Castaneda C, Charnley JM, Evans WJ, Crim MC. Elderly women accommodate to a low-protein diet with losses of body cell mass, muscle function and immune response. *Am J Clin Nutr* 1995;62:30-39.

Catell M. Models of old age among the Samia of Kenya: family support of the elderly. *J Cross-cult Gerontol* 1990;5:375-394.

Centers for Disease Control. Famine-affected, refugee, and displaced populations: recommendations for public health issues. *MMWR* 1992;41:RR-13.

Chandler PJ, Bock RD. Age changes in adult stature: trend estimation from longitudinal data. *Ann Hum Biol* 1991;18:433-440.

Chandra RK. Effect of vitamin and trace-element supplementation on immune responses and infection in elderly subjects. *Lancet* 1992;340:1124-1127.

Chandra RK. Nutrition and the immune system: an introduction. *Am J Clin Nutr* 1997;66:460S-463S.

Chapman KM, Ham JO, Pearlman RA. Longitudinal assessment of the nutritional status of elderly veterans. *J Gerontol* 1996;51A:B261-B269.

Charlton KE, Kruger M, Labadarios D, Wolmarans P, Aronson I. Iron, folate and vitamin B12 status of an elderly South African population. *Eur J Clin Nutr* 1997;51:424-430.

Chernoff R. Nutritional requirements and physiological changes in aging. Thirst and fluid requirements. *Nutr Reviews* 1994;52:S3-S5.

Chilima DM. *Nutritional status and functional ability of older people in rural Malawi*. Ph.D. Thesis, University of London: 1998.

Chilima DM, Ismail SJ. Anthropometric characteristics of older people in rural Malawi. *Eur J Clin Nutr* 1998;52:643-649.

Chumlea WC, Roche AF, Rogers E. Replicability for anthropometry in the elderly. *Hum Biol* 1984;56:329-337.

Chumlea WC, Roche AF, Steinbaugh ML. Estimating stature from knee height for persons 60 to 90 years of age. *Am J Geriatr Soc* 1985;33:116-120.

Chumlea WC, Roche AF, Mukherjee D. Some anthropometric indices of body composition for elderly adults. *J Gerontol* 1986;41:36-39.

Chumlea WC, Mukkerjee D, Roche AF. *Nutritional assessment of the elderly through anthropometry*. Ohio: Fels Research institute, Ross Laboratories, 1987.

Chumlea WC, Garry PC, Hunt WC, Rhyne RL. Distributions of serial changes in stature and weight in a healthy elderly population. *Hum Biol* 1988;60:917-925.

Chumlea WC, Baumgartner RN. Status of anthropometry and body composition data in elderly subjects. *Am J Clin Nutr* 1989;50:1158-1166.

Chumlea WC, Guo S. Equations for predicting stature in white and black elderly individuals. *J Gerontol* 1992;47:M197-M203.

Chumlea WC, Guo SS, Wholihan K, Cockram D, Kuczmarski RJ, Johnson CL. Stature prediction equations for elderly non-Hispanic white, non-Hispanic black, and Mexican-American persons developed from NHANES III data. *J Am Diet Assoc* 1998;98:137-142.

Clark DO, Stump TE, Hui SL, Wolinsky FD. Predictors of mobility and basic ADL difficulty among adults aged 70 years and older. *J Aging & Health* 1998;10:422-440.

Clarke DM, Wahlqvist ML, Strauss BJG. Undereating and undernutrition in old age: integrating bio-psychosocial aspects. *Age & Ageing* 1998;27:527-534.

Clausen F, Sandberg E. Morbidity of elderly people at the village level. In: Bruun FJ, Mugabe M, Coombes Y ed. *The situation of the elderly in Botswana. Proceedings from an international workshop*. Oslo: NIR-SUM, 1994.

Cockram D, Baumgartner R. Evaluation of accuracy and reliability of callipers for measuring recumbent knee height in elderly people. *Am J Clin Nutr* 1990;52:397-400.

Coe RM, Miller DK. Sociological factors that influence nutritional status in the elderly. In: Armbricht HJ, Prendergast JM, Coe RM, eds. *Nutritional Interventions in the aging process*. Springer-Verlag, New York: 1984, pp 3-12.

Collins S. The need for adult therapeutic care in emergency feeding programs. Lessons from Somalia (letter). *J Am Med Assoc* 1993;270:637-38.

Collins S. MUAC as a proxy for BMI in severely emaciated adults. Unpublished paper a.

Collins S. The limit of human adaptation to starvation. Unpublished paper b.

Csuka M, McCarty DJ. Simple method for measurement of lower extremity muscle strength. *Am J Med* 1985;78:77-80.

- D'Amicis A, Ferro-Luzzi A. Overweight of the elderly. *Age & Nutrition* 1992;3:55-58.
- Damme van W. Do refugees belong in camps? Experiences from Goma and Guinea. *Lancet* 1995;346:360-62.
- Davies, L. Nutrition and the elderly: identifying those at risk. *Proceedings of the Nutrition Society* 1984;43:295-302.
- Davies L. Socioeconomic, psychological and educational aspects of nutrition in old age. In: Steen B, ed. Nutrition and Aging. *Age & Ageing*; 1990;19, S37-S42.
- Davies L, Knutson K. Warning signals for malnutrition in the elderly. *J Am Diet Assoc* 1991;91:1413-1417.
- Davies S. Are coping strategies a cop out? *IDS Bull* 1993;24:60-73.
- Davis AP. Targeting the vulnerable in emergency situations: who is vulnerable? *Lancet* 1996;348:868-871.
- Dejene M. *Health and health related problems of the elderly in Dalle Woreda, Southern Ethiopia. Master thesis.* Addis Ababa University: April 1995.
- Delarue J, Constans T, Malvy D, Pradignac A, Couet C, Lamisse F. Anthropometric values in an elderly French population. *Brit J Nutr* 1994;71:295-302.
- Delmi M, Rapin C-H, Bengoa J-M, Delmas PD, Vasey H, Bonjour J-P. Dietary supplementation in elderly patients with fractured neck of the femur. *Lancet* 1990;335:1013-1016.
- Desenclos JC, Berry AM, Padt R, Farah B, Segala C, Nabil AM. Epidemiological patterns of scurvy among Ethiopian refugees. *Bull World Health Org* 1989;67:309-316.
- Deurenberg P, Kooy van de K, Hulshof T, Evers P. BMI as a measure of body fatness in the elderly. *Eur J Clin Nutr* 1989;43:231-236.
- Donkin AJM, Johnson AE, Morgan K, Neale RJ, Lilley JM. The interaction of physical, psychosocial, socioeconomic and sociodemographic variables on the Body Mass Index of the community-dwelling elderly. *J Nutr Health & Aging* 1998;2:143-148.
- Dunlop DD, Hughes SL, Manheim LM. Disability in activities of daily living: patterns of change and a hierarchy of disability. *Am J Public Health* 1997;87:378-383.
- Dutta C. Significance of sarcopenia in the elderly. *J Nutr* 1997;127:9928-9938.
- Egbert AM. The dwindles: failure to thrive in older patients. *Nutr Rev* 1996;54:11S25-S30.

Elam JT, Graney MJ, Beaver T, El Derwi D, Applegate WB, Miller ST. Comparison of subjective ratings of function with observed functional ability of frail older persons. *Am J Public Health* 1991;81:1127-1130.

Elmståhl S, Persson M, Andren M, Blabolil V. Malnutrition in geriatric patients: a neglected problem? *J Advanced Nursing* 1997;26:851-855.

Englund M. Death, trauma and ritual: Mozambican refugees in Malawi. *Soc Sci Med* 1998;46:1164-1174.

Ensrud KE, Nevitt MC, Yunis C, Cauley JA, Seeley DG, Fox KM, Cummings SR. Correlates of impaired function in older women. *Am J Geriatr Soc* 1994;42:481-489.

Ensrud KE, Black DM, Harris F, Ettinger B, Cummings SR for the Fracture Intervention Trial Research Group. Correlates of kyphosis in older women. *J Am Geriatr Soc* 1997;45:682-687.

Era P, Rantanen T. Changes in physical capacity and sensory/psychomotor functions from 75 to 80 years of age and from 80 to 85 years of age - A longitudinal study. *Scand J Soc Med* 1997;53 Suppl:25-43.

Ethangatta LK, Gee MI, Hawrysh ZJ. Protein-energy malnutrition in low income elderly in Nairobi women. *Nat J Food Sciences & Nutrition* 1996; 47: 147-157.

Euronut SENECA investigators. Nutritional status: anthropometry. *Eur J Clin Nutr* 1991a;45:31-42.

Euronut SENECA investigators. Life-style: physical activities and activities of daily living. *Eur J Clin Nutr* 1991b;45:131-151.

Euronut SENECA Investigators. Longitudinal changes in anthropometric characteristics of elderly Europeans. *Eur J Clin Nutr* 1996a;50:S9-S15.

Euronut SENECA investigators. Health and physical performance of elderly Europeans. *Eur J Clin Nutr* 1996b;50:S105-S111.

Evans J. The economic status of older men and women in the Javanese household and the influence of this upon their nutritional level. *J Cross-Cult Gerontol* 1990;5:217-242.

Eveleth PB, Tanner JM. *Worldwide variations in human growth*. Cambridge: Cambridge University Press, 1976.

Feinstein AV, Josephy BR, Wells CK. Scientific and clinical problems in indexes of functional disability. *Ann Internal Medicine* 1986;105:413-420.

Fernando DN, Seneviratna R de A. Physical health and functional ability of an elderly population in Sri Lanka. *Ceylon J Med Science* 1993;36:9-16.

Ferraro KF, Su Y. Financial strain, social relations, and psychological distress among older people: a cross-cultural analysis. *J Gerontol* 1999;54B:S3-S15.

Ferro-Luzzi A, Sette S, Franklin M, James WPT. A simplified approach of assessing adult chronic energy deficiency. *Eur J Clin Nutr* 1992;46:173-180.

Ferro-Luzzi A, James WPT. Adult malnutrition: simple assessment techniques for use in emergencies. *Brit J Nutr* 1996;75:3-10.

Fiatarone MA, Marks EC, Ryan ND, Meredith CN, Lipsitz LA, Evans WJ. High-intensity strength training in nonagenarians. *JAMA* 1990;263:3029-3034.

Fiatarone MA, O'Neill EF, Ryan ND, Clemens KM, Solares GR, Nelson ME, Roberts SB, Kehayias JJ, Lipsitz LA, Evans WJ. Exercise training and nutritional supplementation for physical frailty in very elderly people. *N Eng J Med* 1994;330:1769-1775.

Fillenbaum G. *The well-being of the elderly. Approach to multidimensional assessment*. Geneva: WHO, 1984.

Fillenbaum GG. Screening the elderly. A brief instrumental activities of daily living measure. *J Am Geriatr Soc* 1985;33:698-706.

Fillenbaum GG. Assessment of health and functional status: an international comparison. In: Kane RL, Evans JG, Macfayden D eds. *Improving the health of older people: a world review*. Oxford University Press, 1990.

Fillenbaum GG. Functional ability. In: Ebrahim E, Kalache A eds. *Epidemiology in old age*. London: BMJ Publishing Group, 1996.

Fischer J, Johnson MA. Low body weight and weight loss in the aged. *J Am Diet Ass* 1990;90:1697-1706.

Fleiss JL. *Statistical methods for rates and proportions*. (Second edition). New York: John Wiley and Sons, 1981.

Forbes WF, Hayward LM, Agwani N. Factors associated with the prevalence of various self-reported impairments among older people residing in the community. *Can J Public Health* 1991;82:240-244.

Frisancho AR. *Anthropometric standards for the assessment of growth and nutritional status*. USA: Ann Arbor, University of Michigan Press, 1990.

Frisancho R. New standards of weight and body composition by frame size and height for assessment of nutritional status of adults and the elderly. *Am J Clin Nutr* 1984;40:808-819.

Frisancho AR. New norms of upper limb fat and muscle areas for assessment of nutritional status. *Am J Clin Nutr* 1981;34:2540-2545.

Frontera WR, Hughes VA, Lutz KJ, Evans WJ. A cross-sectional study of muscle strength and mass in 45- to 78-yr-old men and women. *J Appl Physiol* 1991;71:644-650.

Gallagher D, Visser M, Sepulveda D, Pierson RN, Harris T, Heymsfield SB. How useful is body mass index for comparison of body fatness across age, sex, and ethnic groups? *Am J Epidemiol* 1996;143:228-239.

Galanos AN, Pieper CF, Comoni-Huntley JC, Bales CW, Fillenbaum G. Nutrition and function: is there a relationship between body mass index and the functional capabilities of community-dwelling elderly? *J Am Geriatr Soc* 1994;42:368-373.

Garcia M, Kennedy E. Assessing linkages between low body mass index and morbidity in adults: evidence from four developing countries. *Am J Clin Nutr* 1994;48:S90-S97.

Garn SM, Leonard WR, Hawthorne VM. Three limitations of the BMI. *Am J Clin Nutr* 1986;44:996-997.

Gibson RS. *Principles of nutritional assessment*. Oxford: Oxford University press, 1990.

Godfrey N. *The health needs of elderly refugees: a field study in Eastern Sudan*. Unpublished report 1985.

Godfrey N, Kalache A. Health needs of older adults displaced to Sudan by war and famine: questioning current targeting practices in health relief. *Soc Sci Med* 1989;28:707-713.

Goodwin JS, Goodwin JM, Garry PJG. Association between nutritional status and cognitive functioning in a healthy elderly population. *J Am Med Assoc* 1983;249:2917-2921.

Gorman M. Older people and development: the last minority? *Development in Practice* 1995;5:117-127.

Gosman-Hedström G, Aniansson A, Persson G-B. ADL-reduction and need for technical aids among 70-year-olds. From the population study of 70-year-olds in Göteborg. *Compr Gerontol B* 1988;2:16-23.

Graafmans WC, Ooms ME, Hofstee HMA, Bezemer PD, Bouter LM, Lips P. Falls in the elderly: a prospective study of risk factors and risk profiles. *Am J Epidemiol* 1996;143:1129-1136.

Grimby G. Muscle performance and structure in the elderly as studied cross-sectionally and longitudinally. *J of Gerontology* 1995;50A:17-22.

Grimby G, Saltin B. The ageing muscle. *Clin Physiol* 1983;3:209-218.

Groot de LCPGM, Beck AM, Schroll M, Staveren van WA. Evaluating the DETERMINE Your Nutritional Health Checklist and the Mini Nutritional Assessment as tools to identify nutritional problems in elderly Europeans. *Eur J Clin Nutr* 1998;52:877-883.

Grundy E. Social networks and support. In: Ebrahim E, Kalache A ed. *Epidemiology in old age*. London: BMJ Publishing Group, 1996.

Guo C-B, Zhang W, Ma D-Q, Zhang K-H, Huang JQ. Hand grip strength: an indicator of nutritional state and the mix of postoperative complications in patients with oral and maxillofacial cancers. *Brit J Oral & Maxillofacial Surgery* 1996;34:325-327.

Guralnik JM, Branch LG, Cummings SR, David Curb J. Physical performance measures in aging research. *J Gerontol* 1989;44:M141-M146.

Guralnik JM, Lacroix AZ. Assessing physical function in older populations. In: Wallace RB, Woolson RF eds. *The epidemiologic study of the elderly*. New York, Oxford: Oxford University Press, 1992.

Gurrici S, Hatriyanti Y, Hautvast JGAJ, Deurenberg P. Relationship between body fat and body mass index: differences between Indonesians and Dutch Caucasians. *Eur J Clin Nutr* 1998;52:779-783.

Haga H, Shibata H, Ueno M, Nagai H, Suyama Y, Matsuzaki T, Yasumura S, Koyano W, Hatano S. Factors contributing to longitudinal changes in activities of daily living (ADL): the Koganei study. *J Cross-Cult Gerontol* 1991;6:91-99.

Hakewill PA, Moren A. Monitoring and evaluation of relief programmes. *Tropical doctor* 1991;21:S24-S28.

Harrell-Bond BE. *Imposing Aid. Emergency assistance to refugees*. Oxford: Oxford University Press, 1986.

Hatloy A, Torheim LE, Oshaug A. Food variety - a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa. *Eur J Clin Nutr* 1998;52:891-898.

Heikkinen E, Waters WE, Brzezinski ZJ. *The elderly in eleven countries. A sociomedical survey*. Copenhagen: WHO, 1983.

Heikkinen E, Era P, Jokela J, Jylhä M, Lyyra A, Pohjolainen P. Socioeconomic and life-style factors as modulators of health and functional capacity with age. In: Schroots J, ed. *Ageing, health and competence*. Elsevier Science Publications, 1993.

HelpAge International & the London School of Hygiene and Tropical Medicine. *Assessing the nutritional vulnerability of older people in developing countries. A report*



of the Symposium held on September 23 and 24 1997. Gregory K, Peachey K ed. London: 1997.

Henry CJK. BMI and the limits of human survival. *Eur J Clin Nutr* 1990;44:329-335.

Herman DR, Solomons NW, Mendoza I, Gonzales C, Qureshi AK. Anthropometric measures and indices of body composition among Guatemalan elderly: relationship with self-rated health and activities of daily living and comparison with other sites in the 'Food Habits in Later Life' multicentre study. *Asia Pac J Clin Nutr* 1998;7:55-64.

Heslop A. *Needs assessment in Changara district for development of the resettlement programme in Tete. Report for HAI.* 1995.

Heymsfield SB, McManus C, Smith J, Stevens V, Nixon DW. Anthropometric measurements of muscle mass: revised equations for calculating bone-free arm muscle areas. *Am J Clin Nutr* 1982;36:680-690.

Heymsfield SB, Olafson RP, Kutner MH, Nixon DW. A radiographic method of quantifying protein-calorie undernutrition. *Am J Clin Nutr* 1979;32:693-702.

Hibbert ME, Lanigan A, Raven J, Phelan PD. Relation of armspan to height and the prediction of lung function. *Thor* 1988;43:657-659.

Higgs PF, MacDonald LD, Ward MC. Responses to the institution among elderly patients in hospital long-stay care. *Soc Sci Med* 1992;35:287-293.

Himes JH, Roche AF, Webb P. Fat areas as estimates of total body fat. *Am J Clin Nutr* 1980;33:2093-2100.

Hoogendoorn A. *End of mission report. Tanzania. Food and nutrition coordinator Rwandan/Burundi refugee camps. 15 august - 23 december 1994.* Ngara: UNHCR, 1994.

Horwitz A, Macfayden DM, Munro H, Scrimshaw NS, Steen B, Williams TF eds. *Nutrition in the elderly.* Oxford: Oxford University Press, 1989.

Houx PJ. *Cognitive aging and health-related factors. Doctoral thesis.* Maastricht: University of Limburg, 1991.

Hughes S, Gibbs J, Dunlop D, Edelman P, Singer R, Chang RW. Predictors of decline in manual performance in older adults. *J Am Geriatr Soc* 1997;45:905-910.

Huijbregts PPCW, Feskens EJM, Räsänen L, Fidanza F, Alberti-Fidanza A, Nissinen A, Giampaoli S, Kromhout D. Dietary patterns and cognitive function in elderly men in Finland, Italy and the Netherlands. *Eur J Clin Nutr* 1998;52:826-831.

Hurley BF. Age, gender, and muscular strength. *J Gerontol* 1995;50A:41-44.

Hyatt RH, Whitelaw MN, Bhat A, Scott S and Maxwell JD. Association of muscle strength with functional status of elderly people. *Age & Ageing* 1990;19:330-336.

Idema KT, Hsu-Hage BH-H, Li Y-H, Wahlqvist ML, Rao X, Zhang K, Kuang TH, Zhang DL, Dai ZR. Body composition as a predictor of blood pressure in three communities in Guangdong province, China. *Asia Pac J Clin Nutr* 1998;7:70-76.

Ingstad B, Bruun FJ. Elderly people as care providers and care receivers. In: Bruun FJ, Mugabe M, Coombes Y ed. *The situation of the elderly in Botswana. Proceedings from an international workshop*. Oslo: NIR-SUM, 1994.

Institute of Medicine. *The second fifty years: promoting health and preventing disability*. Washington: National Academy Press, 1990.

Immink MDC, Flores A, Diaz EO. Body Mass Index, body composition and the chronic energy deficiency classification of rural adult populations in Guatemala. *Eur J Clin Nutr* 1992;46:419-427.

Ismail S, Manandhar M. *Better nutrition for older people: assessment and action*. HelpAge International, London, 1999.

Jagger C, Spiers NA, Clarke M. Factors associated with decline in function, institutionalisation and mortality of elderly people. *Age & Ageing* 1993;22:190-197.

James WPT, Ferro-Luzzi A, Waterlow CJ. Definition of chronic energy deficiency in adults. Report of a Working Party of the International Dietary Energy Consultative Group. *Eur J Clin Nutr* 1988;42:969-981.

James WPT, François PJ. The choice of cut-off point for distinguishing normal body weights from underweight or 'chronic energy deficiency' in adults. *Eur J Clin Nutr* 1994;48:S179-S184.

James WPT, Mascie-Taylor GCN, Norgan NG, Bistran BR, Shetty PS, Ferro-Luzzi A. The value of arm circumference measurements in assessing chronic energy deficiency in Third world adults. *Eur J Clin Nutr* 1994;48:883-894.

Jaspars S. *The Rwandan refugee crisis in Tanzania: initial successes and failures in food assistance. Relief and Rehabilitation Network Paper 6*. London: ODI, 1994.

Jayarajan MP, Shetty PS. Cardiovascular responses to sustained hand grip in chronically undernourished subjects. *Internal J Food Sci Nutr* 1992;43:19-24.

Jitapunkul S, Kamolratanakul P, Ebrahim S. The meaning of activities of daily living in a Thai elderly population. Development of a new index. *Age & Ageing* 1994;23:97-101.

Jensen GL, Kita K, Fish J, Heydt D, Frey C. Nutrition risk screening characteristics of rural older persons: relation to functional limitations and health care charges. *Am J Clin Nutr* 1997;66:819-828.

Jette AM, Branch LG, Berlin J. Musculoskeletal impairments and physical disablement among the aged. *J Gerontol* 1990;45:M203-208.

Johnell O, O'Neill T, Felsenberg T, Kanis J, Cooper C, Silman AJ and the European Vertebral Osteoporosis Study (EVOS) Group. Anthropometric measurements and vertebral deformities. *Am J Epidemiol* 1997;146:287-293.

Judge JO, Schlechtman K, Cress E and the FICSIT Group. The relationship between physical performance measures and independence in instrumental activities of daily living. *J Am Geriatr Soc* 1996;44:1332-1341.

Jylhä M, Guralnik JM, Ferrucci L, Jokela J, Heikkinen E. Is self-rated health comparable across cultures and genders? *J Gerontology* 1998;53B:S144-S152.

Kalipeni E, Oppong J. The refugee health crisis in Africa and implications for health and disease: a political ecology approach. *Soc Sci Med* 1998;46:1637-1653.

Kalache A. Ageing in developing countries. In: Pathy MSJ ed. *Principles and practice of geriatric medicine*. Chichester, UK: John Wiley and Sons, 1991.

Kallman DA, Plato CC, Tobin JD. The role of muscle loss in the age-related decline of grip strength: cross-sectional and longitudinal perspectives. *J Gerontol* 1990;45:M82-M88.

Kaplan G, Barell V, Lusky A. Subjective state of health and survival in elderly adults. *J Gerontol* 1988;43:S114-S120.

Kaplan GM, Wurtele SK, Gillis D. Maximal effort during functional capacity evaluations: an examination of psychological factors. *Arch Phys Med Rehabil* 1996;77:161-164.

Katz S, Akpom CA. A measure of primary sociobiological functions. *Internat J Health Services* 1976;6:493-507.

Katz S, Branch LG, Branson MH, Papsidero JA, Bech JC, Greer DS. Active life expectancy. *N Eng J Med* 1983;309:1218-1224.

Katz S, Stroud MW. Functional assessment in geriatrics: a review of progress and directions. *Am J Geriatr Soc* 1989;37:267-271.

Katz S, Downs TD, Cash HR, Grotz RC. Progress in the development of the index of ADL. *Gerontologist* 1970;1:20-30.

Keen D. *Surviving at what cost? Famine, needs-assessment and survival strategies in Africa*. Report for Oxfam: 1992.

Kempen GJMJ, Heuvelen van MJG, Brink van den RHS, Kooijman AC, Klein M, Houx PJ, Ormel J. Factors affecting contrasting results between self-reported and performance-based levels of physical limitations. *Age & Ageing* 1996;25:458-464.

Kinsella K. Demographic aspects. In: Ebrahim E, Kalache A eds. *Epidemiology in old age*. London: BMJ Publishing Group, 1996.

King JE, Mazariegos M, Valdez C, Castañeda C, Solomons NW. Nutritional indicators and their interactions in rural Guatemalan elderly: a study in San Pedro Ayampuc. *Am J Clin Nutr* 1997;66:795-802.

Kirkwood BR. *Essentials of medical statistics*. London: Blackwell Science Ltd, 1988.

Klidjian AM, Foster KJ, Kammerling RM, Cooper A, Karran SJ. Relation of anthropometric and dynamometric variables to serious postoperative complications. *Br Med J* 1980;281:899-901.

Kogi-Makau W. Risk indicators of nutritional status of households of a Kenyan semi-arid population. *East Afr Med J* 1992;69:560-562.

Kohrs MB, Czajka-Narins DM, Nordstrom JW. Factors affecting nutritional status of the elderly. In: Munro H, Danford D, eds. *Nutrition, ageing and the elderly*. New York: Plenum Press, 1989.

Koyano W, Shibata H, Nakazato K, Haga H, Suyama Y, Matsuzaki T. Mortality in relation to instrumental activities of daily living: One-year follow-up in a Japanese urban community. *J Gerontol* 1989;44:S107-109.

Kroeger A. Health interview surveys in developing countries: a review of the methods and results. *Internat J Epidemiol* 1983;12:465-481.

Kuczmarski R. Need for body composition information in elderly subjects. *Am J Clin Nutr* 1989;50:1150-1157.

Kwok T, Whitelaw M. The use of armspan in nutritional assessment of the elderly. *J Am Geriatr Soc* 1991;39:492-496.

Lamb VL. A cross-national study of quality of life factors associated with patterns of elderly disablement. *Soc Sci Med* 1996;42:363-377.

Lamb VL. Gender differences in correlates of disablement among the elderly in Egypt. *Soc Sci Med* 1997;45:127-136.

Launer L, Harris T (on behalf of the Ad Hoc Committee on the Statistics of Anthropometry and Aging). Weight, height and body mass index distributions in

geographically and ethnically diverse samples of older persons. *Age & Ageing* 1996;25:300-306.

Law M, Letts L. A critical review of scales of activities of daily living. *Am J Occup Therapy* 1989;43:522-528.

Lawton MP, Brody EM. Assessment of older people: self maintaining and instrumental activities of daily living. *Gerontologist* 1969;9:179-186.

Leer van EM, Noord van PAH, Seidell JC. Components of adult height and height loss. Secular trend and effects of ageing in women in the DOM project. *Ann Epidemiol* 1992;2:611-615.

Lehman AB. Review: Undernutrition in elderly people. *Age & ageing* 1989;18:339-353.

Lehman AB, Bassey EJ, Morgan K, Dallosso HM. Normal values for weight, skeletal size and BMI in 890 men and women aged over 65 years. *Clin Nutr* 1991;10:18-22.

Lehman AB, Bassey EJ. Longitudinal weight changes over four years and associated health factors in 629 men and women aged over 65. *Eur J Clin Nutr* 1996;50:6-11.

Lesourd BM. Nutrition and immunity in the elderly: modification of immune responses with nutritional treatments. *Am J Clin Nutr* 1997;66:478S-484S.

Lexell J. Human aging, muscle mass, and fiber type composition. *J Gerontol* 1995;50A:11-16.

Liang MTC, Chumlea WMC. Balance and strength of elderly Chinese men and women. *J Nutr Health & Aging* 1998;2:21-27.

Lindgren A, Svärdsudd K, Tibblin G. Factors related to perceived health among elderly people: The Albertina Project. *Age & Ageing* 1994;23:328-333.

Lipschitz D. Nutrition and ageing. In: Evans JG, Williams TF, eds. *Oxford textbook of geriatric medicine*. Oxford: Oxford University Press, 1992.

Liu X, Liang J, Gu S. Flows of social support and health status among older persons in China. *Soc Sci Med* 1995;41:1175-1184.

Lohman TG, Roche AF, Martorell R, eds. *Anthropometric standardization reference manual*. Human Kinetics Books. Illinois: Champaign, 1988.

Longhurst R. Conceptual frameworks for linking relief and development. *IDS Bull* 1994;25:17-23.

Lopes J, Russell D McR, Whitwell J, Jeejeebhoy KN. Skeletal muscle function in malnutrition. *Am J Clin Nutr* 1982;36:602-610.

- Lukasi HC. Methods for the assessment of human body composition; traditional and new. *Am J Clin Nutr* 1987;46:537-556.
- MacLennan WJ, Hall MRP, Timothy JI, Robinson M. Is weakness in old age due to muscle wasting? *Age & Ageing* 1980;9:188-192.
- Manandhar MC. Functional ability and nutritional status of free living elderly people. *Proceedings of the Nutrition Society* 1995;54:677-691.
- Manandhar MC, Anklesaria PS, Ismail SJ. Weight, skinfolds and circumference characteristics of poor elderly people in Mumbai, India. *Asia Pac J Clin Nutr* 1997;6:191-199.
- Manandhar MC. *Undernutrition and impaired functional ability amongst elderly slum dwellers in Mumbai, India*. Ph.D. Thesis, University of London: 1999.
- Manton KG, Dowd LE, Woodbury MA. Conceptual and measurement issues in assessing disability cross-nationally: analysis of a WHO-sponsored survey of the disablement process in Indonesia. *J Cross-Cult Gerontol* 1986;1:339-362.
- Manton KG, Myers GC, Andrews GR. Morbidity and disability patterns in four developing nations: their implications for social and economic integration of the elderly. *J Cross-Cult Gerontol* 1987;2:115-129.
- Mardel S, Hailey PC, Mahmutovic A, Broom J, Golden MHN, Franklin M, Mills CF. Micronutrient status of the besieged residents of Sarajevo: May 1993. *Eur J Clin Nutr* 1995;49:S46-S61.
- Markides KS, Lee DJ. Predictors of well-being and functioning in older Mexican Americans and Anglos: an eight-year follow-up. *J Gerontol* 1989;45:S69-S73.
- Marzi, H. Old Age in Rwanda: a problem? *Bold* 1994;5:3-8.
- Matilla K, Haavisto M, Rajala S. Body mass index and mortality in the elderly. *Brit Med J* 1986;292:867-868.
- Matuja WBP, Ndosi NK. The elderly patients as seen at Muhimbili medical centre, Tanzania. *East Afr Med J* 1994;71:142-145.
- McCallin M. Psychological needs of Mozambican refugees - a community-based approach. *Tropical Doctor* 1991;21:S67-S69.
- McCormack P. Undernutrition in the elderly population living at home in the community: a review of the literature. *J Adv Nursing* 1997;26:856-863.
- McCracken JA, Pretty JN, Conway GR. *An introduction to rapid rural appraisal for agricultural development*. London: IIED, 1988.

- McNabb SJN, Welch K, Laumark S, Peterson DE, Ratard RC, Toole MJ, Farley TA. Population-based nutritional risk survey of pensioners in Yerevan, Armenia. *Am J Prev Med* 1994;10:65-70.
- McPherson JR, Lancaster DR, Carroll JC. Stature change with aging in black Americans. *J Gerontol* 1978;33:20-25.
- McWriter JP, Pennington CR. Incidence and recognition of malnutrition in the hospital. *Brit Med J* 1994;308:945-948.
- Médecins Sans Frontières. Jean F. ed. *Populations in danger* 1995. London: Médecins Sans Frontières (UK), 1995.
- Merrill SS, Seeman TE, Kasl SV, Berkman LF. Gender differences in the comparison of self-reported disability and performance measures. *J Gerontol* 1997;52A:M19-M26.
- Messer E. Intra-household allocation of food and health care: current findings and understandings - introduction. *Soc Sci Med* 1997;44:1675-1684.
- Mets TF. The disease pattern of elderly medical patients in Rwanda, central Africa. *J Trop Med Hygiene* 1993;96:291-300.
- Micozzi MS, Albanes D, Jones Y, Chumlea WC. Correlations of body mass indices with weight, stature, and body composition in men and women in NHANES I and II. *Am J Clin Nutr* 1986;44:725-731.
- Miller DK, Carter ME, Sigmund RH, Smith JQ, Miller JP, Bentley JA, McDonald K, Coe RM, Morley JE. Nutritional risk in inner-city-dwelling older black Americans. *J Am Geriatr Soc* 1996;44:959-962.
- Milne JS, Lauder IJ. Age effects in kyphosis and lordosis. *Ann Hum Biol* 1974;1:327-337.
- Milne JS, Williamson J. A longitudinal study of kyphosis in older people. *Age & Ageing* 1983;12:225-233.
- Milne JS, Maule MM. A longitudinal study of handgrip and dementia in older people. *Age & Ageing* 1984;13:42-48.
- Mitchell CO, Lipachitz DA. Arm length measurement as an alternative to height in nutritional assessment of the elderly. *J Par Ent Nutr* 1982;6:226-229.
- Moore II DH. A study of age group track and field records to relate age and running speed. *Nature* 1975;253:264-265.

Moren A, Lemoult D, Brodel A. Pellagra in Mozambican refugees (letter). *Lancet* 1990;335:1403-1404.

Mowe M, Bohmer T. Reduced nutritional status in an elderly population (>70 y) is probable before disease and possibly contributes to the development of disease. *Am J Clin Nutr* 1994;59:317-324.

Mowe M, Bohmer T. Nutrition problems among home-living elderly people may lead to disease and hospitalization. *Nutr Rev* 1996;54:11S22-S24.

Munro HN, Danford DE ed. *Nutrition, aging and the elderly*. New York: Plenum Press, 1989.

Mupedziswa R. *Elderly camp refugees and social development: Traditional status - a salient dimension compromised?* Paper presented at a HelpAge Workshop "Change and development through workshops". 11 - 12 September 1989. Harare: 1989.

Mutran EJ, Reitzes DC, Mossey J, Fernandez ME. Social support, depression, and recovery of walking ability following hip fracture surgery. *J Gerontol* 1995;50B:S354-S361.

National Institute of Health, USA. *National Health and Nutrition Examination Survey III: Physical function examination manual*. Bethesda, Maryland: 1990.

Needham R. Refugee participation. *Refugee Participation Network* 1994;17:17-19.

Ndaba N, O'Keefe SJD. The nutritional status of black adults in rural districts of Natal and Kwazulu. *South Afr Med J* 1985;68:588-590.

Ngome E. A rapid assessment of the perception of the elderly on the problem of ageing in Botswana. In: Bruun FJ, Mugabe M, Coombes Y ed. *The situation of the elderly in Botswana. Proceedings from an international workshop*. Oslo: NIR-SUM, 1994.

Nieburg P, Person-Karell B, Toole MJ. Malnutrition-mortality relationships among refugees. *J Ref Studies* 1992;5:247-256.

Nikolaus T, Bach M, Siezen S, Volkert D, Oster P, Schlierf G. Assessment of nutritional risk in the elderly. *Ann Nutr Metab* 1995;39:340-345.

Noppa H, Andersson M, Bengtsson C, Bruce Å, Isaksson B. Longitudinal studies of anthropometric data and body composition. The population study of women in Göteborg, Sweden. *Am J Clin Nutr* 1980;33:155-162.

Norgan NG. Body mass index and body energy stores in developing countries. *Eur J Clin Nutr* 1990;44:79-84.



- Norgan N. BMI and nutritional status: the effect of adjusting BMI for relative sitting height on estimates of the prevalence of CED, overweight and obesity. *As Pac J Clin Nutr* 1994a.
- Norgan N. Population differences in body composition in relation to the body mass index. *Eur J Clin Nutr* 1994b;48:S3-S27.
- Norgan N. Interpretation of low body mass indices: Australian Aborigines. *Am J Phys Anthropol* 1994c;94:229-237.
- Norušis MJ. *SPSS 7.5 Guide to data analysis*. New Jersey: Prentice Hall, 1997.
- Nubé M, Asenso-Okyere WK, Boom van den GJM. Body mass index as indicator of standard of living in developing countries. *Eur J Clin Nutr* 1998;52:135-144.
- O'Donoghue, Heslop A (on behalf of HelpAge International). Finding out who is vulnerable. *Ageways* 1997;45:11-14.
- Okojie FA. Aging in Sub-Saharan Africa: toward a redefinition of needs research and policy directions. *J Cross-Cult Gerontol* 1988;3:3-19.
- Oliver S. *Study of older refugees: issues, needs and capabilities*. UNHCR Community Services, 1997.
- Onis de M, Habicht J-P. Anthropometric reference data for international use: Recommendations from a WHO expert committee. *Food Nutr Bull* 1997;18:179-189.
- Oranga HM. Ageing and poverty in rural Kenya: community perception. *East Afr Med J* 1997;74:611-613.
- Ortega RM, Requejo AM, Andrés P, López-Sobaler AM, Quintas ME, Redondo MS, Navia B, Rivas T. Dietary intake and cognitive function in a group of elderly people. *Am J Clin Nutr* 1997;66:803-809.
- Ostwald SK, Snowdon DA, Rysavy SM, Keenan NL, Kane RL. Manual dexterity as a correlate of dependency in the elderly. *J Am Geriatr Soc* 1989;37:963-969.
- PAHO. *A profile of the elderly in Guyana. Technical Paper series no 24*. Rome: WHO, 1989.
- Pankhurst A. Vulnerable groups. Paper presented at the symposium "Assistance to Refugees; Alternative Viewpoints", 27-31 March 1984, Oxford. *Disasters* 1984;8:206-213.
- Parker JM, Dillard TA, Phillips YY. Arm span-height relationships in patients referred for spirometry. *Am J Respir Care Med* 1996;154:153-156.

Pearson MB, Bassey EJ, Bendall MJ. Muscle strength and anthropometric indices in elderly men and women. *Age & Ageing* 1985;14:49-54.

Penninx BWJH, Tilburg van T, Kriegsman DMW, Deeg DJH, Boeke AJP, Eijk van JTM. Effects of social support and personal coping resources on mortality in older age: The Longitudinal Aging Study Amsterdam. *Am J Epidemiol* 1997;146:510-519.

Phillips P. Grip strength, mental performance and nutritional status as indicators of mortality risk among female geriatric patients. *Age & Ageing* 1986;15:53-56.

Pinholt EM, Kroenke K, Hanley JF, Kussman MJ, Twyman PL, Carpenter JL. Functional assessment of the elderly. A comparison of standard instruments with clinical judgement. *Arch Intern Med* 1987;147:484-488.

Potter J, Schafer D, Bohi R. In-hospital mortality as a function of BMI; an age dependent variable. *J Gerontol* 1988;43:M59-M63.

Posner BM, Jette A, Smigelski C, Miller D, Mitchell P. Nutritional risk in New England elders. *J Gerontol* 1994;49:M123-M132.

Pryer JA. Body mass index and work-disabling morbidity: results from a Bangladeshi case study. *Eur J Clin Nutr* 1993;47:653-657.

Pryer J. Nutritionally vulnerable households in the urban slum economy: a case study from Khulna, Bangladesh. In: Schell LM, Smith MT, Bilsborough A eds. *Urban ecology and health in the Third World*. Cambridge University Press, 1993.

Queinnec E, Rigal J. Food aid and vitamin deficiencies in the refugee camps. In: Jean F. ed. *Populations in danger 1995*. London: Médecins Sans Frontières (UK), 1995.

Rabe B, Thamrin MH, Gross R, Solomons NW, Schultink W. Body mass index of the elderly derived from height and from armspan. *Asia Pac J Clin Nutr* 1996;5:79-83.

Ramji S, Thoner G. Nutritional status of displaced Mozambican elderly living in Mozambique and Zimbabwe. Surveyed in June - July 1987. *Näringsforskning* 1991;35:24-31.

Rantanen T, Era P, Heikkinen E. Maximal isometric strength and mobility among 75-year-old men and women. *Age & Ageing* 1994;23:132-137.

Rantanen T, Guralnik JM, Foley D, Masaki K, Leveille S, Curb JD, White L. Midlife handgrip strength as a predictor of old age disability. *J Am Med Assoc* 1999;281:558-560.

Rea IM, Gillen S, Clarke E. Anthropometric measurements from a cross-sectional survey of community dwelling subjects aged over 90 years of age. *Eur J Clin Nutr* 1997;51:102-106.

Reed BA, Habicht J-P. Sales of food aid as sign of distress, not excess. *Lancet* 1998;351:128-130.

Reeves SL, Varakamin C, Henry CJK. The relationship between arm-span measurement and height with special reference to gender and ethnicity. *Eur J Clin Nutr* 1996;50:398-400.

Reid IR, Evans MC, Ames R. Relationships between upper-arm anthropometry and soft-tissue composition in postmenopausal women. *Am J Clin Nutr* 1992;56:463-466.

Restrepo HE, Rozental M. The social impact of aging populations: some major issues. *Soc Sci Med* 1994;39:1323-1338.

Reuben DB, Moore AA, Damesyn M, Keeler E, Harrison GG, Greendale GA. Correlates of hypoalbuminemia in community-dwelling older persons. *Am J Clin Nutr* 1997;66:38-45.

Reynolds R. Development in a refugee situation. The case of Rwandan refugees in northern Tanzania. *Refugee Participation Network* 1995;18:24-26.

Rikli R, Busch S. Motor performance of women as a function of age and physical activity level. *J Gerontol* 1986;41:645-649.

Ritmeijer K. *Body Mass Index as indicator of adult nutritional status. The absence of appropriate cut-off points for defining adult malnutrition in South Sudan*. Internal Paper Médecins Sans Frontières - Holland, 1990.

Rivers J. Women and children last: An essay on sex discrimination in disasters. *Dis* 1982;6:256-267.

Roebathan BV, Chandra RK. Relationship between nutritional status and immune function of elderly people. *Age & Ageing* 1994;23:49-53.

Rolland-Cachera MF, Cole TJ, Sempé M, Tichet J, Rossignol C, Charraud A. Body mass index variations: centiles from birth to 87 years. *Eur J Clin Nutr* 1991;45:13-21.

Rosenberg IH. Sarcopenia: Origins and clinical relevance. *J Nutr* 1997;127:990S-991S.

Rosenberg IH, Russell RM, Bowman BB. Aging and the Digestive System. In: Munro H, Danford DE, eds. *Nutrition, aging and the elderly: Human nutrition. A comprehensive treatise no.6*. Plenum Press, New York, London. pp 43-60, 1989.

Roubenoff R, Kehayias JJ. The meaning and measurements of lean body mass. *Nut Rev* 1991;49:163-175.

Roubenoff R, Wilson PWF. Advantage of knee height over height as an index of stature in expression of body composition in adults. *Am J Clin Nutr* 1993;57:609-613.

- Rozzini R, Bianchetti A, Franzoni S, Zanetti O, Trabucchi M. Social, functional and health status influences on mortality: considerations of a multidimensional inquiry in a large elderly population. *J Cross-cult Gerontol* 1991;6:83-90.
- Rudberg MA, Furner SE, Cassel CK. Measurement issues in preventive strategies: past, present, and future. *Am J Clin Nutr* 1992;55:1253S-1256S.
- Rudkin L. Dependency status and happiness with old age on Java. *Gerontologist* 1994;34:217-223.
- Rush D. Nutrition screening in old people: its place in a coherent practice of preventive health care. *Ann Rev Nutr* 1997;17:101-125.
- Russell D McR, Leiter LA, Whitwell J, Marliss EB, Jeejeebhoy KN. Skeletal muscle function during hypocaloric diets and fasting: a comparison with standard nutritional assessment parameters. *Am J Clin Nutr* 1983a;37:133-138.
- Russell D McR, Prendergast PJ, Darby PL, Garfinkel PE, Whitwell J, Jeejeebhoy KN. A comparison between muscle function and body composition in anorexia nervosa: the effect of refeeding. *Am J Clin Nutr* 1983b;38:229-237.
- Rutherford OM, Jones DA. The relationship of muscle and bone loss and activity levels with age in women. *Age & Ageing* 1992;21:286-293.
- Rwezaura BA. Changing community obligations to the elderly in contemporary Africa. *J Soc Dev* 1989;4:5-24.
- Ryan SD, Fried LP. The impact of kyphosis on daily functioning. *J Am Geriatr Soc* 1997;45:1479-1486.
- Sahyoun NR, Jaques PF, Dallal GE, Russell RM. Nutrition Screening Initiative checklist may be a better awareness/educational tool than a screening one. *J Am Diet Assoc* 1997;97:760-764.
- Schlettwein-Gsell D. Nutrition and the quality of life: a measure for the outcome of nutritional intervention? *Am J Clin Nutr* 1992;55:1263S-6S.
- Schwartz RS. Body fat distribution in healthy young and older men. *J Gerontol* 1990;45:M181-M185.
- Seeman TE, Carpentier PA, Berkman LF, Tinetti ME, Guralnik JM, Albert M, Blazer D, Rowe JW. Predicting changes in physical performance in a high functioning elderly cohort: MacArthur studies of successful aging. *J Gerontol* 1994;49:M97-M108.
- Seeman TE, Bruce ML, McAvay GJ. Social network characteristics and onset of ADL disability: MacArthur studies of successful aging. *J Gerontol* 1996;51:S191-S200.

Sen K, Kalache A, Coombes Y. Ageing, health, social change and policy in developing countries: a review. In: Kelk T. Ed. *Ageing Programme*. Health Promotion Sciences Unit, Department of Public Health and Policy. PHP Departmental Publication no.9. London School of Hygiene and Tropical Medicine, 1993.

Sen K. *Ageing. Debates on demographic transition and social policy*. London: Zed Books Ltd, 1994.

Shahar S, Earland J, Rahman SA. Malnutrition and dietary inadequacy among rural elderly Malays: simple indices to identify individuals at high risk. *Proceedings of the Nutrition Society* 1999;58:4A.

Shahar S, Earland J, Dixon RA. Adequacy of dietary energy and nutrient intakes among rural elderly Malays. *Proceedings of the Nutrition Society* 1998;57:59A.

Shetty P, James W. *BMI. A measure of chronic energy deficiency in adults*. Rome: FAO, 1994.

Shetty PS. Body composition in malnutrition. In: Davies PSW, Cole TJ eds. *Body composition techniques in health and disease*. Cambridge University Press, 1995.

Shizgall HM, Vasilevsky CA, Wang W, Tuitt DA, Brabant GV. Nutritional assessment and skeletal muscle function. *Am J Clin Nutr* 1986;44:761-771.

Shoham J. *Towards a revision of emergency supplementary feeding programme practice*. Unpublished summary of ODA evaluation report. 1995.

Shye D, Mullooly JP, Freeborn DK, Pope CR. Gender differences in the relationship between social network support and mortality: a longitudinal study of an elderly cohort. *Soc Sci Med* 1995;41:935-947.

Skelton DA, Greig CA, Davies JM, Young A. Strength, power and related functional ability of healthy people aged 65-89 years. *Age & Ageing* 1994;23:371-377.

Solomons NW. Nutrition and aging: potentials and problems for research in developing countries. *Nutr Reviews* 1992;50:224-229.

Spector WD, Katz S, Murphy JB, Fulton JP. The hierarchical relationship between ADL and IADL. *J Chron Dis* 1987;40:481-489.

Spiriduso WW. Physical fitness, aging, and psychomotor speed: a review. *J Gerontol* 1980;35:850-865.

SPSS Inc. *Statistical Package for the Social Sciences, version 6.0*. Chicago, Illinois: SPSS Inc, 1993.

Squire C. Emergencies: Elderly People - their role and their needs. In: *Oxfam Field Director's Handbook*. Oxfam, 1991.

Steele MF, Mattox JW. Correlation of armspan and height in young women of two races. *Ann Hum Biol* 1987;14:445-447.

Steele MF, Chenier TC. Armspan, height and age in black and white women. *Ann Hum Biol* 1990;17:533-541.

Steen B. Body composition and aging. *Nut Rev* 1988;46:45-51.

Steen B. Body composition. In: Horowitz A, Macfayden DM, Munro H, Scrimshaw NS, Steen B, Williams TF, eds. *Nutrition in the elderly*. Oxford: Oxford University Press/WHO, 1989;108-114.

Steen B, MacLennan WJ. Nutrition. In: Pathy MSJ ed. *Principles and practice of geriatric medicine*. Chichester, UK: John Wiley and Sons, 1991.

Strachan P. *Problems of older refugees: an overview*. Unpublished report 1986.

Strawbridge WJ, Camacho TC, Cohen RD, Kaplan GA. Gender differences in factors associated with change in physical functioning in old age: a 6-year longitudinal study. *Gerontologist* 1993;33:603-609.

Strawbridge WJ, Cohen RD, Shema SJ, Kaplan GA. Successful aging: predictors and associated activities. *Am J Epidemiol* 1996;144:135-141.

Strawbridge WJ, Shema SJ, Balfour JL, Higby HR, Kaplan GA. Antecedents of frailty over three decades in an older cohort. *J Gerontology* 1998;53B:S9-S16.

Strickland S, Uliaszek S. Body mass index, ageing and differential reported morbidity in rural Sarawak. *Eur J Clin Nutr* 1993;47:9-19.

Strickland S, Uliaszek S. Body mass index and illness in rural Sarawak. *Eur J Clin Nutr* 1994;48:S98-S109.

Stuck AE, Walthert JM, Nikolaus T, Büla CJ, Hohmann C, Beck JC. Risk factors for functional status decline in community-living elderly people: a systematic literature review. *Soc Sci Med* 1999;48:445-469.

Suboticanec K, Stavljenic A, Bilic-Pešic L, Gorajšcan M, Gorajšcan D, Brubacher G, Buzina R. Nutritional status, grip strength, and immune function in institutionalised elderly. *Internat J Vit Nutr Research* 1989;59:20-28.

Syryani LK, Adnjana AK, Thong D, Manik IR, Putra DKW, Widjaja W, Tama DW, Jensen GD. The physical and mental health of elderly in a Balinese village. *J Cross-Cult Gerontol* 1988;3:105-120.

Thomas J, Atkinson H. *Participatory appraisal in Kibungo Prefecture, Rwanda. "Abakecuru n'Abasaza"*. Report to HelpAge International. March - April 1995.

Tinetti ME. Performance oriented assessment of mobility problems in elderly patients. *Am J Geriatr Soc* 1986;34:119-126.

Tinetti ME, Bake DI, MacAvay G, Claus EB, Gottschalk M, Garrett P, Koch ML, Trainor K, Horwitz RI. A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *New Engl J Med* 1994a;331:821-827.

Tinetti ME, Mendes de Leon CF, Doucette JT, Baker DI. Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. *J Gerontol* 1994b;49:M140-M147.

Tinetti ME, Williams CS. The effect of falls and fall injuries on functioning in community-dwelling older persons. *J Gerontol* 1998;53A:M112-M119.

Togonu-Bickersteth F. Self-assessed health as predictor of objective health status among rural aged in Nigeria. *J Cross-Cult Gerontol* 1987;2:79-91.

Toole MJ, Waldman RJ. Prevention of excess mortality in refugee and displaced populations in developing countries. *J Am Med Assoc* 1990;263:3296-3302.

Toole MJ, Waldman RJ. Refugees and displaced persons. War, hunger, and public health. *J Am Med Assoc* 1993;270:600-605.

Toole MJ. Mass population displacement. A global public health challenge. *Infectious Disease Clinics of North America* 1995;9:353-65.

Toole MJ. Vulnerability in emergency situations (commentary). *Lancet* 1996;348:840.

Toole MJ, Waldman RJ. The public health aspects of complex emergencies and refugee situations. *Ann Rev Public Health* 1997;18:283-312.

Tully CL, Snowdon DA. Weight change and physical function in older women: findings from the Nun study. *J Am Geriatr Soc* 1995;43:1394-1397.

Tuomilehto J. BMI and prognosis in elderly hypertensive patients: A report from the European Working Party on high blood pressure in the elderly. *Am J Med* 1991;90:S34-S41.

Ulijaszek SI, Lourie JA. Intra- and inter-observer error in anthropometric measurement. In: Ulijaszek SJ, Mascie Taylor CGN, eds. *Anthropometry: the individual and the population*. Cambridge: Cambridge University Press, 1994.

United Nations Administrative Committee on Coordination-Subcommittee on Nutrition (ACC-SCN) in collaboration with the International Food Policy Research Institute. Chapter 3: "The Nutrition Situation of Refugee and Displaced Populations". *Update on the nutrition situation, 1994*. Washington D.C.:1994.

UN General Assembly. *Resolution 46/91 United Nations Principles for Older Persons*, Geneva: 16 December 1991.

United Nations. *Older persons in the family; facets of empowerment. Occasional papers series no.4*. Geneva: UN, 1993.

United Nations. *Report of the international conference on population and development, Cairo 5 - 13 September 1994*. Cairo: UN, 1994.

UNICEF. *Women and children in Tanzania. A situation analysis*. Government of the United Republic of Tanzania and United Nations Children's Fund Dar es Salaam: 1990.

Vailas LI, Nitzke SA, Becker M, Gast J. Risk indicators for malnutrition are associated inversely with quality of life for participants in meal programs for older adults. *J Am Diet Assoc* 1998;98:548-553.

Varakamin C, Henry J, Golden M, Tontisirin K. Body composition and muscular strength in an elderly Thai population. *Proceedings of the Nutrition Society* 1998;57:64A.

Vaz M, Thangam S, Prabhu A, Shetty PS. Maximal voluntary contraction as a functional indicator of adult chronic undernutrition. *Brit J Nutr* 1996;76:9-15.

Vellas B, Conceicao J, Lafont Ch, Fontan B, Garry PJ, Adoue D, Albaredo JL. Malnutrition and falls (letter). *Lancet* 1990;336:1447.

Vellas BJ, Albaredo J-L, Garry PJ. Diseases and aging: patterns of morbidity with age; relationship between aging and age-associated diseases. *Am J Clin Nutr* 1992;55:1225S-1230S.

Vellas BJ, Wayne SJ, Garry PJ, Baumgartner RN. A two-year longitudinal study of falls in 482 community-dwelling elderly adults. *J Gerontol* 1998;53A:M264-M274.

Verbrugge LM, Jette AM. The disablement process. *Soc Sci Med* 1994;38:1-14.

Vespa J. *Nutritional status assessment of the elderly in developing countries: using functional capacity as an outcome indicator*. London: Centre for Human Nutrition, 1992.



Vespa J, Watson F. Who are the nutritionally vulnerable in Bosnia-Herzegovina? *Brit Med J* 1995;311:652-654.

Waal de A. War and famine in Africa. *IDS Bull* 1993;24:33-40.

Wahlqvist ML, Flint DM. Assessment of loss of height in elderly women. *Eur J Clin Nutr* 1988;42:679-682.

Walmsley CM, Bates CJ, Prentice A, Cole TJ. Relationship between smoking, antioxidant intake and status indices in older people. *Proceedings of the Nutrition Society* 1999;58:5A.

Wang J, Thornton JC, Russell M, Burastero S, Heymsfield S, Pierson RN Jr. Asians have lower body mass index (BMI) but higher percent body fat than do whites: comparisons of anthropometric measurements. *Am J Clin Nutr* 1994;60:23-28.

Waswa JK, Jansen AAJ, Minawa A, Gekonyo JM. The nutritional status of an elderly population in a rural area in Embu district, Kenya. *East Afr Med J* 1988;65:578-587.

Watkin DM. The physiology of aging. *Am J Clin Nutr* 1982;36:750-758.

Watson F, Kulenovic I, Vespa J. Nutritional status and food security: winter nutrition monitoring in Sarajevo 1993-1994. *Eur J Clin Nutr* 1995;49:S23-S32.

Watson F, Vespa J. The impact of a reduced and uncertain food supply in three besieged cities of Bosnia-Herzegovina. *Disasters* 1995;19:216-234.

Watters DAK, Haffjee AA, Angorn IB, Duffy KJ. Nutritional assessment by hand grip dynamometer. *South Afr Med J* 1985;68:585-587.

Webb AR, Newman LA, Taylor M, Keogh JB. Hand grip dynamometry as a predictor of postoperative complications reappraisal using age standardized grip strengths. *J Parental and Enteral Nutr* 1989;13:30-33.

WFP/UNHCR. *Memorandum of Understanding*. March 1997.

WFP/UNHCR. *WFP/UNHCR guidelines for estimating food and nutritional needs in emergencies*. Geneva: 1997.

Wheeler EF. *Intra-household food allocation; a review of evidence*. Paper prepared for the meeting "The Sharing of Food". Bad Homburg: December 1984.

WHO. *International classification of impairment, disabilities and handicaps (ICIDH)*. Geneva: World Health Organisation, 1980.

WHO. *Health of the elderly*. Technical Report Series 779. Geneva: World Health Organisation, 1989.

WHO. *Physical status: Use and interpretation of anthropometry*. Technical Report Series 854. Geneva: World Health Organisation, 1995.

WHO. *Hypertension Control*. Technical Report Series 862. Geneva: World Health Organisation, 1996.

WHO. Use and interpretation of anthropometry in the elderly for the assessment of physical status. *J Nutr Health & Aging* 1998;2:5-17.

Wiener JM, Hanley RJ, Clark R, Nostrand van JF. Measuring the activities of daily living: comparisons across national surveys. *J Gerontol* 1990;45:S229-S237.

Williams ME, Hadler NM, Earp JAL. Manual ability as a marker of dependency in geriatric women. *J Chron Dis* 1982;35:115-122.

Williams ME, Gaylord SA, Gerrity MS. The timed manual performance test as a predictor of hospitalisation and death in a community-based elderly population. *J Am Geriatr Soc* 1994;42:21-27.

Wilson AO, Adamchak DJ, Nyanguru AC, Hampson J. A study of well-being of elderly in three communities in Zimbabwe. *Age & Ageing* 1991;20:275-279.

Wilson KB. Enhancing refugees' own food acquisition strategies. *J Refugee Studies* 1992;5:226-245.

Winick M ed. *Nutrition and aging*. New York: John Wiley & Sons, 1976.

Wolfson L, Judge J, Whipple R, King M. Strength is a major factor in balance, gait, and the occurrence of falls. *J Gerontol* 1995;50A:64-67.

Wolinsky FD, Coe RM, Miller DK, Prendergast JM. Measurement of the global and functional dimensions of health status in the elderly. *J Gerontol* 1984;39:88-92.

Wolinsky FD, Coe RM, McIntosh WA, Kubena KS, Prendergast JM, Chavez MN, Miller DK, Romeis JC, Landmann WA. Progress in the development of a nutritional risk index. *J Nutr* 1990;120:1549-1553.

Woo J, Ho SC, Donnan SPB, Swaminathan R. Nutritional status of healthy, active, Chinese elderly. *Brit J Nutr* 1988;60:21-28.

World Bank. *African Development Indicators*. Washington D.C.: World Bank, 1997.

World Bank. *Social Indicators of development 1995. A World Bank Book*. Baltimore: World Bank, John Hopkins University Press, 1995.

Yassin Z, Terry RD. Anthropometric characteristics of rural elderly females in Malaysia. *Ecology Food & Nutrition* 1991;26:109-117.

Young H, Jaspars S. Nutrition, disease and death in times of famine. *Disasters* 1995;19:95-109.

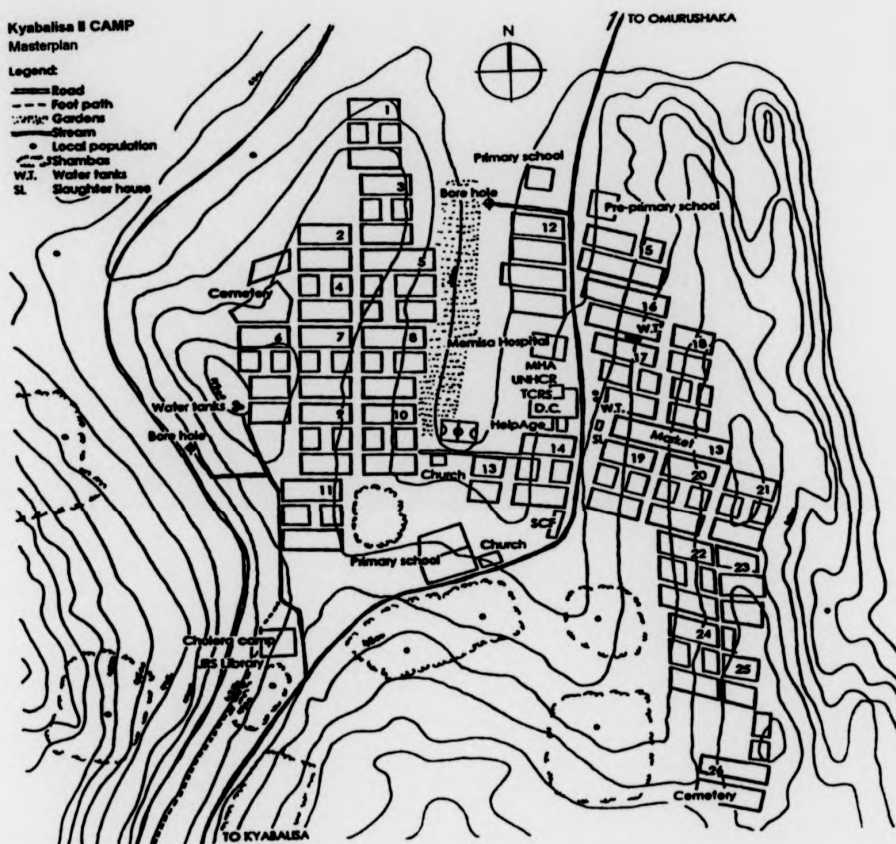
## **Annexes**

## Annex 5.1 Lay-out of Chabalisa II

Kyabalisa II CAMP  
Masterplan

## Legend:

- Road
- - Foot path
- Gardens
- Stream
- Local population
- Shambas
- W.J. Water tanks
- SL Slaughter house



**Annex 5.2 Informed consent form**

**HELPAge INTERNATIONAL KARAGWE TANZANIA**  
**NUTRITION RESEARCH PROJECT**  
**CHABALISA II**

**Informed Consent Form**

I, the undersigned, agree voluntarily to participate in the Nutrition Research Project of HelpAge International and the London School of Hygiene and Tropical Medicine being conducted in Chabalisa II refugee camp, Karagwe.

The aims and methodologies of the research have been fully explained to me. I understand that the information will be used to develop better guidelines for the assessment of nutritional and functional problems of elderly refugees.

I understand that, in agreeing to participate, I will undergo:

1. a clinical examination from a nurse
2. anthropometric measurements of body size
3. simple physical performance tests of functional ability
4. a questionnaire about my activities of daily life
5. a questionnaire about social and nutritional problems

I agree to participate on condition that the information I give will be used in confidence and that I am free to withdraw at any time.

Signed

Witnessed by Nurse/Supervisor

Name

Name

Signature

Signature

Date

Date

### Annex 5.3 Indian data and formula for sample size calculation

#### Indian data on handgrip strength and undernutrition

Men < 65	Impaired handgrip	%	Adequate handgrip	Total
BMI < 18.5	31	28.7	77	108
BMI ≥ 18.5	20	10.0	180	200
Total	51		257	308
Men ≥ 65				
BMI < 18.5	21	52.5	19	40
BMI ≥ 18.5	23	29.5	55	78
Total	44		74	118
Women < 65				
BMI < 18.5	48	31.0	107	155
BMI ≥ 18.5	52	17.9	239	291
Total	100		346	446
Women ≥ 65				
BMI < 18.5	33	56.9	25	58
BMI ≥ 18.5	26	41.9	36	62
Total	59		61	120

The formula  $m$  (sample size in each group) for studies with unequal group size is (Fleiss, 1981):

$$m = \frac{m'}{4} \left[ 1 + \sqrt{1 + \frac{2(r+1)}{m'r|P_2 - P_1|}} \right]^2$$

with:

$$m' = \frac{\left[ \left( C_{\alpha/2} \sqrt{(r+1)p(1-p)} + C_{1-\beta} \sqrt{r(p_1(1-p_1) + p_2(1-p_2))} \right)^2 \right]}{r(p_2 - p_1)^2}$$

where:

- $r$  : ratio of group 1 / group 2
- $p_1$  : proportion in group 1
- $p_2$  : proportion in group 2
- $p$  :  $(p_1 + rp_2) / (1 + r)$
- $C_{\alpha/2}$  : Z (standard normal) at significance level  $\alpha/2$  (a-risk)
- $C_{1-\beta}$  : Z (standard normal) at significance level  $1-\beta$  (power)

#### Annex 5.4 Formulae for derived variables

$$\text{BMI (Body Mass Index, kg/m}^2\text{)} = \text{weight} / \text{height}^2$$

$$\text{BMI-armspan (BMI based on armspan, kg/m}^2\text{)} = \text{weight} / \text{armspan}^2$$

$$\text{BMI-halfspan (BMI based on halfspan, kg/m}^2\text{)} = \text{weight} / (2 * \text{halfspan})^2$$

$$\text{BMI-kneeheight (BMI based on kneeheight, kg/m}^2\text{)} = \text{weight} / \text{height}^2,$$

where *height* is estimated from kneeheight using the sex-specific equations for non-Hispanic black people developed by Chumlea (1998).

The demispan index is sex-specific (Lehman et al, 1991):

$$\text{Men: Demiquet (kg/m}^2\text{)} = \text{weight} / \text{demispan}^2$$

$$\text{Women: Mindex (kg/m}^2\text{)} = \text{weight} / \text{demispan}^2$$

Derived arm muscle and fat variables are the following (Frisancho, 1984):

$$\text{TUA (total upper-arm area)} = \text{MUAC}^2 / 4\pi$$

$$\text{AMA (upper-arm muscle area)} = \frac{\text{MUAC} - (\text{triceps} * \pi)^2}{4\pi} \quad (\text{triceps in cm})$$

To exclude bone area, a correction is applied (minus 10 for men and minus 6.5 for women) that gives CAMA (Heymsfield, 1982).

$$\text{AFA (upper-arm fat area)} = \text{TUA} - \text{AMA}$$

$$\text{AFI (arm fat index)} = (\text{AFA} / \text{TUA}) * 100$$



### Annex 5.5 Formulae for the technical error of measurement and reliability

The formula for two measurements per subject (used for intra-observer error):

$$\text{Technical error of measurement (TEM)} = \sqrt{\frac{\sum D^2}{2N}}$$

where D is the difference between measurements and N is the number of subjects

The formula for more than two measurements per subject (used for inter-observer error):

$$\text{TEM} = \sqrt{\frac{\sum_{i=1}^N \left( \sum_{j=1}^K x_j^2 - \frac{\left( \sum_{j=1}^K x_j \right)^2}{K} \right)}{N(K-1)}}$$

where N is the number of subjects

K is the total number of determinations of the variable taken on each subject

$x_j^2$  is the squared value of the  $j^{\text{th}}$  replicate of the measurement ( $j = 1, 2, \dots, K$ )

$$\text{Reliability (R)} = 1 - \frac{\text{TEM}^2}{s^2}$$

where  $s^2$  is the variance

## Annex 5.6 Inter- and intra-observer errors for anthropometric measurements

Measurement errors	Inter	R inter	Intra obs. 1	R intra 1	Intra obs. 2	R intra 2	n
Weight (kg)	0.115	0.999	0	1	0	1	15
Height (cm)	0.266	0.999	0.087	0.999	0.111	0.999	34
Armspan (cm)	0.791	0.995	0.239	0.999	0.284	0.999	35
Halfspan (cm)	0.425	0.995	0.296	0.997	0.195	0.998	35
Demispan (cm)	0.602	0.987	0.248	0.997	0.228	0.998	35
MUAC (cm)	0.183	0.991	0.058	0.999	0.051	0.999	15
Triceps (mm)	0.389	0.992	0.273	0.996	0.256	0.996	15
Biceps (mm)	0.311	0.908	0.125	0.986	0.106	0.995	14
Subscapular (mm)	0.461	0.982	0.320	0.991	0.427	0.984	15
Kneeheight (cm)	0.351	0.989	0.077	0.999	0.049	0.999	34
Calfcircumf. (cm)	0.172	0.993	0.051	0.999	0.063	0.999	15

## Annex 5.7 ADL questionnaire

HELPAE INTERNATIONAL KARAGWE  
Elderly Nutrition Research  
Chabalisa II Refugee Camp

## ACTIVITIES OF DAILY LIVING QUESTIONNAIRE

## AGE

1. What is your age? |\_|\_|\_|
2. In what year were you born? |\_|\_|\_|\_|
3. How old were you at Rwandan independence? |\_|\_|
4. How old were you when you got married? |\_|\_|
5. How old is your eldest child? |\_|\_|
6. How old were you when he/she was born? |\_|\_|

"Now we are going to ask you some questions about your ability to do basic daily activities in and around your home during the last week.

We need to know whether you are able to perform a task by yourself independently, or whether you need a little help, or if you need a lot of help or need constant help".

Independence means without supervision, direction, or active personal assistance.

ADLs are used as a record of what a person actually DOES, not a record of what a patient COULD DO. The main aim is to establish a DEGREE OF INDEPENDENCE FROM ANY HELP, PHYSICAL OR VERBAL, however minor and for what reason. Any supervision means that a person is NOT INDEPENDENT. Coding a person into the middle category 2 implies at least 50% of the effort is supplied by that person themselves in a particular task.

**7. Feeding (Eating)**

In the last week, have you been able to eat normal food, not just soft or liquid food? (This can be food cooked and served by others but not cut up).

Has someone put food into your mouth for you or have you been able to take food from your plate by yourself?

1. Unable - needs assistance in all aspects of feeding, cutting up and putting in mouth, wiping etc. does not eat or is fed by a tube.
2. Needs some assistance in feeding and cutting up food etc., but not all the time and not for all foods.
3. Totally able to feed self and eat normal food.

### 8. Transfer

In the last week have you been able to get up and down from the floor on your own?

Has it been easy or difficult to do this on your own?

In the last week, have you been able to move around the blende (from floor to standing, to bench or chair) by yourself or has someone been helping you?

If you need help, normally how many people help you? Who are they?

Are you able to sit up without support?

1. Unable - needs total assistance in moving on and off floor, to chair / bench, cannot move by self without being lifted or held by one or two people, and cannot sit unsupported
2. Needs some assistance in moving on and off floor to chair/bench, may be guided or supported for safety but is not totally lifted, can sit unsupported
3. Can move between floor, chair/bench totally independently and sit unsupported

### 9. Dressing

In the last week, have you been able to dress yourself (wrapping khanga, pulling on blouse or shirt, tying strings, fastening buttons or zips, pulling trousers, cardigan, dress on and off), independently or do you require assistance?

If you require assistance, is this for all your dressing or for only about half?

Are all your clothes normal or have you made any adaptations to them to make dressing easier?

1. Unable - cannot dress self at all, may remain partially undressed
2. Needs assistance with some aspects of dressing, help with buttons / zips but can put on some garments on alone
3. Independent, can take all clothes on and off by self and perform all details

### 10. Bathing

In the last week, have you been able to wash your body fully and without help?

Or are you only able to wash part of your body without help?

If you had assistance, who helped you and what did they do?

1. Unable - requires direct assistance and supervision of all bathing activities
2. Can perform some aspects without assistance but for safety is often directly assisted, or can only wash part of body by self and not full body
3. Can bathe completely alone

### 11. Using the toilet

In the last week, have you been able to get from your blende to the latrine independently, by yourself and without a helper?

To get to the latrine do you use any support such as a walking stick or crutches? (at night this may be management of bedpan by self)

Do you require assistance, such as a member of your family to help you?

Can you undress yourself for toileting, get down to squat and back up again, clean yourself afterwards, and leave the latrine?

Or do you always use a bedpan (potty, bucket, bowl etc) for all your toileting?

1. Unable - cannot reach the latrine unless assisted all the way, cannot undress, squat and clean self unassisted and leave the latrine. If unable to leave blende, cannot use home toilet (pan, bowl, bucket) unassisted etc.
2. Receives some assistance in some of the tasks, either getting to and from, undressing, squatting, cleaning self. But can do some things alone or only needs help sometimes
3. Independent : can perform all tasks by self

**12. Continence**

Some people have difficulties reaching the toilet in time. Do you also have this problem?  
How often? Always, sometimes, never?

Can you control your urination? Can you control your defecation?

1. Total incontinence in urination and defecation.
2. Partial or occasional incontinence in urination and defecation.
3. Urination and defecation entirely self-controlled.

**13. Assistance**

Who mainly helps you with the activities of daily living you cannot perform yourself?

1 = Yes 2 = No

- a. Nobody
- b. Spouse
- c. Son (in law)
- d. Daughter (in law)
- e. Grandchild(ren)
- f. Other relative
- g. Friend or neighbour
- h. NGO
- i. Other .....

**SELF REPORTED GROSS MOBILITY**

14. Can you climb the hills in this camp? Can you cross the drainages?

1. No
2. Yes, but with difficulty / slowly / with helper / only infrequently
3. Yes, easily, frequently, can use a stick

15. Can you walk about 1 km such as from here to the catholic church?

1. No
2. Yes, but with difficulty / slowly / with helper / only infrequently
3. Yes, easily, frequently, can use a stick

16. Do you ever travel to places beyond walking distance? If so, how do you travel (by bicycle / truck)? Can you travel alone?

1. Unable to travel unless emergency arrangements are made
2. Yes with some help such as an assistant / slowly / only infrequently or if really necessary
3. Yes, easily, frequently, can travel alone if necessary, can use a stick

**17. Observed mobility**

1. very poor
2. fair
3. good

**Annex 5.8 Clinical screening protocol****HELPAge INTERNATIONAL, KARAGWE, TANZANIA****ELDERLY NUTRITION RESEARCH  
CHABALISA II****CLINICAL ASSESSMENT****Objective :**

The objective of this examination and questionnaire is to record symptoms related to health conditions that can affect nutritional status (appetite, absorption, energy levels) and/or functional ability (mobility, muscle strength, psycho-motor function, flexibility, manual dexterity, mental status)

**Methodology :**

Simple clinical screening involving questions and observations by a nurse. As far as possible symptoms of the following health conditions are included: loss of senses (especially sight), dentition, gastro-intestinal disorders (diarrhoea, constipation, vomiting, sickness, ascites), vitamin/mineral deficiencies (pellagra, scurvy, xerophthalmia, goitre), anaemia, respiratory infections (including TB), oedema, malaria, diabetes, arthritis, arthrosis, disability, depression, medication, cognitive status, alcohol intake, smoking. Subjects will be asked to bring their Out Patient Department (OPD) card if they have one.

Blood pressure and pulse will be taken using a battery operated digital blood pressure monitor.

Before you begin, you must briefly explain about HelpAge, the purpose of the research, the measurements and tests to be taken and informed consent. Ask name and address. Give next ID number. Write also in the nurse register.

"Thank you for coming here and spending some of your time with us. We are researchers from HelpAge International and we would like to ask you some questions and make some examinations that will help us find out if there are nutritional problems among old people in the camp. This examination will take about one hour.

Before we begin, we would like you to tell us whether or not you understand why we are here and that you agree to take part in this research.

We will start by giving you a brief examination and ask you some general questions to find out about symptoms of ill health. We will then do some simple physical tests which measure your strength, mobility, flexibility, balance and coordination. Then lastly we will take some measurements of your body size, and the amount of fat and muscle to assess your nutritional status.

Do you understand what we are doing and do we have your consent to continue? Sign or make thumb print on Informed Consent form.

1. Paleness of conjunctiva, inside of lower eyelid.
  1. Yes
  2. No
2. Redness of conjunctiva.
  1. Yes
  2. No
3. Do you produce eye pus (especially in the morning so that eyelids stick together)?
  1. Yes
  2. No
4. Whiteness of lens.
  1. Yes
  2. No
5. How would you rate your vision?
  1. Blind
  2. Poor (long and short sightedness)
  3. Moderate (long or short sightedness)
  4. Good
6. Are any of your own teeth missing (also observe)?
  1. Yes, all
  2. Yes but only some
  3. No, have all own teeth
7. Do you wear false teeth (dentures)?
  1. Yes, all
  2. Yes, some
  3. No, do not need any
8. Do you have any problems chewing food (give examples)?
  1. Yes, always all food
  2. Sometimes, some food
  3. No, never
9. Are there any foods that you cannot eat these days because of your teeth?
  1. Yes, very many
  2. Yes, with some food
  3. No, all foods eaten
10. If yes, which foods?
11. Observe hair colour.
  1. Reddish-brown
  2. Grey
  3. Black
12. If reddish-brown, has it always been this colour?
  1. Yes
  2. No

13. If changed, when did it change?
  1. Less than 1 year ago
  2. More than 1 year ago
14. Observe hair curls.
  1. Straight
  2. No hair
  3. Curly
15. If straight, has it always been like that?
  1. Yes
  2. No
16. If changed, when/how did it change?
  1. Less than 1 year ago
  2. More than 1 year
  3. Straightened by self
17. Observe visible goitre.
  1. Yes
  2. No
18. Observe hyperpigmentation around neck
  1. Yes
  2. No
19. Observe sores and/or ulcers on tongue.
  1. Yes
  2. No
20. Observe gums swollen and/or sore.
  1. Yes
  2. No
21. Do your gums bleed easily?
  1. Yes
  2. No
22. Do you have ulcers or wounds (also observe)?
  1. Yes
  2. No
23. Do wounds take a very long time to heal (more than 2 weeks)?
  1. Yes
  2. No
24. Observe : Is there any dyspnea?
  1. Yes
  2. No
25. Have you been coughing in the last week?
  1. Yes
  2. No



26. If yes, for how long have you been coughing?  
1. More than 1 month  
2. 1 week to 1 month  
3. Less than 1 week
27. If yes, do you produce sputum?  
1. Yes  
2. No
28. If yes, what is the colour of the sputum?  
1. Bloody  
2. Yellow-green  
3. Colourless-white
29. Have you had a watery stool in the last week?  
1. Yes  
2. No
30. If yes, how many times a day?  
..... times
31. If yes, for how long has it been like this?  
1. More than 1 month  
2. 1 week to 1 month  
3. Less than 1 week
32. Do you have pain when passing stool?  
1. Yes often  
2. Yes but only sometimes  
3. No never
33. If yes, for how long have you had this problem?  
1. More than 1 month  
2. 1 week to 1 month  
3. Less than 1 week
34. Have you been feeling nausea in the last week?  
1. Yes, many times  
2. Yes, sometimes  
3. No
35. Have you been vomiting in the last week?  
1. Yes, many times  
2. Yes, a few times  
3. No
36. Observe whether swollen, hard abdomen with a shiny, tight skin.  
1. Yes  
2. No
37. Have you been sweating excessively (drops on face, wet clothes) and shivering alternately in the last week?  
1. Yes  
2. No

38. If yes, at what times?  
1. Only at night  
2. In episodes  
3. Only in the day  
4. Any time
39. If yes, how long has it been like this?  
1. More than 1 month  
2. 1 week to 1 month  
3. Less than 1 week
40. Do you suffer from painful or swollen, red, warm joints (also observe)?  
1. Yes  
2. No
41. If yes, which joints?
42. Have you recently had any surgery or injury, or other health problem that prevents you from standing, walking, using latrine?  
1. Yes, affects all FA tests  
2. Yes, affects some tests  
3. No
43. Do you use a walking aid such as a walking stick or crutches?  
1. Yes, always  
2. Yes, sometimes  
3. No, never
44. If yes, are you able to walk at all without your stick/crutches?  
1. No, never  
2. Yes, sometimes  
3. Yes, always
45. Observe whether there is any curvature of the spine (kyphosis).  
1. Yes, severe  
2. Yes, slight  
3. No
46. Observe whether presence of excess fluid in lower legs.  
(test for oedema : moderate pressure leaves a pit)  
1. Yes  
2. No
47. If yes, check whether cause is recorded on Out Patients Department (OPD) card.  
1. Nutritional  
2. Renal  
3. Cardiac  
4. Not recorded, unknown
48. Observe OPD card and record any medication in the last week.
49. Did you use any other drugs in the last week that are not on this card?

50. Have you ever been treated with insulin?  
1. Yes  
2. No
51. Record systolic blood pressure.
52. Record diastolic blood pressure.
53. Record pulse.
54. I will say 3 words then I want you to repeat them. Say: MOON WATER FIRE.  
Please repeat them.  
1. None recalled  
2. 1 correct  
3. 2 correct  
4. All 3 correct
55. How healthy would you say you are compared to other people of your own age?  
1. Very poor health  
2. Moderate health  
3. Good health
56. Have you noticed any problem with your memory?  
Do you sometimes forget things you did recently or where you put things?  
1. Very frequently  
2. Sometimes  
3. No never
57. What happens if you are extremely anxious/worried?  
1. Anti-social behaviour  
2. Passiveness  
3. Lack of concentration  
4. Lack of appetite  
5. Sleeping problems  
6. Palpitations (irregular, high pulse rate)  
7. Goose skin  
8. Crying (with no apparent reason)  
9. Sweating  
10. Nothing  
11. Other.....
58. How often did this happen in the last year?  
1. Frequently  
2. Sometimes  
3. Never
59. Can you tell me what day it is today?  
1. Incorrect, confused  
2. Eventually correct  
3. First correct response
60. Can you tell me what year this is?  
1. Incorrect, confused  
2. Eventually correct  
3. First correct response

61. How long is it until (or since) Christmas/Easter?
  1. Incorrect, confused
  2. Eventually correct
  3. First correct response
62. Ask : can you remember the three words I asked you to repeat earlier?
  1. None recalled
  2. 1 correct
  3. 2 correct
  4. All 3 correct
63. Do you drink alcohol (beer/spirits)?
  1. Yes, every day
  2. Sometimes a week
  3. No never
64. Do you smoke?
  1. Yes, every day
  2. Sometimes a week
  3. No never
65. Observe cognitive / mental status.
  1. Very poor
  2. Fair
  3. Normal, good
66. Observe general movement (mobility).
  1. Very poor
  2. Fair
  3. Good
67. Observe hearing.
  1. Very poor
  2. Impaired
  3. Normal, good

## Annex 5.9 Social factors questionnaire

HELPPAGE INTERNATIONAL, KARAGWE, TANZANIA

ELDERLY NUTRITION RESEARCH  
CHABALISA IISOCIAL FACTORS QUESTIONNAIRE


---

Code	77.	Don't know
	88.	Not applicable
	99.	No response

---

## 1. At present, what is your marital status?

1. Never married
2. Civil marriage
3. Traditional marriage
4. Staying together unmarried
5. Widowed
6. Divorced
7. Separated
8. Remarried
9. Second wife

## 2. How many children were born?

number: ..

## 3. What is your education?

1. Illiterate, no education at all
2. Adult literacy
3. Standard 1-6
4. Form 1-3
5. Diploma 4-5
6. Diploma 6-7
7. University
8. Other .....

## 4. Where is your home in Rwanda?

1. Village in Rukara/Kigarama
2. Village outside Rukara/Kigarama
3. Urban area in Rukara/Kigarama
4. Urban area outside Rukara/Kigarama

## 5. When did you leave your home?

year: month:

## 6. Where did you go?

1. Chabalisa (ignore next question)
2. Other camp in Tanzania
3. Elsewhere in Tanzania: .....
4. Internal displaced camp in Rwanda
5. Other countries: .....

## 7. When did you arrive in Karagwe?

year: month:

8. What was your occupation in Rwanda?
1. Landless farmer
  2. Farmer with land
  3. Farmer with land and cattle
  4. Civil servants in government/parastatals: .....
  5. Private workers/business post: .....
9. What was your husband's occupation in Rwanda?
1. Landless farmer
  2. Farmer with land
  3. Farmer with land and cattle
  4. Civil servants in government/parastatals: .....
  5. Private workers/business post: .....
10. Whom lives with you in your blende? (Record numbers)
- a. Subject lives alone
  - b. Spouse
  - c. Children
  - d. Grandchildren
  - e. Other relatives
  - f. Other unrelated persons
11. Who takes care for you when you are ill? 1=no, 2=yes
- a. Nobody
  - b. Spouse
  - c. Son (in law)
  - d. Daughter (in law)
  - e. Grandchildren
  - f. Other relatives
  - g. Friend/neighbour
  - h. NGOs
  - i. Other, specify.....
12. Are there people who get physical assistance from you? (Record numbers)
- a. Nobody
  - b. Spouse
  - c. Children
  - d. Grandchildren
  - e. Other relative
  - f. Friend/neighbour
  - g. Other, specify.....
13. What are your activities? 1=no, 2=yes
- a. Gardening
  - b. Heavy household tasks (eg fetching water/firewood)
  - c. Light household tasks (eg cooking, cleaning)
  - d. Child care
  - e. Mat making
  - f. Black smithing
  - g. Sandal making
  - h. Basket making
  - i. Pottery
  - j. Tailoring
  - k. Other, specify.....

14. Do you do anything for which you receive money or goods (such as food, firewood, clothes etc.)?
1. No, never
  2. Yes, occasionally
  3. Yes, often
15. Does your household have a kitchen garden?
1. No
  2. Yes
16. Does your household cultivate any other land?
1. No
  2. Yes
17. What do you cultivate? 1=no, 2=yes
- a. Beans
  - b. Sweet potatoes
  - c. Maize
  - d. Bright coloured vegetables
  - e. Other vegetables
  - f. Other: .....
18. What do you do with the produce? 1=no, 2=yes
- a. Household consumption
  - b. Is sold
  - c. Is exchanged
  - d. Is given away
  - e. Is used to pay debts
19. For how many persons do you receive food from TCRS (general distribution)?  
number: ..
20. Since you have been in the camp, have you received any food besides the general distribution?
1. No
  2. Yes, daily
  3. Weekly
  4. Monthly
  5. Occasionally
21. If yes, from whom did you receive food? 1=no, 2=yes
- a. Children
  - b. Grandchildren
  - c. Other relatives
  - d. Friends/ neighbours
  - e. NGOs
  - f. Other, specify.....
22. What did you do with the food? 1=no, 2=yes
- a. Personal consumption
  - b. Household consumption
  - c. Was sold
  - d. Exchanged for other food items
  - e. Exchanged for non food items
  - f. Was given away
  - g. Used to pay debts
  - h. Other, specify.....

23. Since you have been in the camp, have you received any goods? 1=no, 2=yes  
 a. Plastic sheeting  
 b. Blankets  
 c. Clothes  
 d. Soap  
 e. Utensils  
 f. Others: .....
24. If yes, from whom did you receive goods? 1=no, 2=yes  
 a. Children  
 b. Grandchildren  
 c. Other relatives  
 d. Friends/neighbours  
 e. NGOs  
 f. Other, specify.....
25. What did you do with the goods? 1=no, 2=yes  
 a. Personal use  
 b. Household use  
 c. Was sold  
 d. Exchanged for food  
 e. Exchanged for other goods  
 f. Was given away  
 g. Used to pay debts  
 h. Other, specify
26. Since you have been in the camp, have you received any money? How often?  
 1. No  
 2. Yes, daily  
 3. Weekly  
 4. Monthly  
 5. Occasionally
27. From whom did you receive money? 0=no, 1=yes  
 a. Children  
 b. Grandchildren  
 c. Other relatives  
 d. Friends/neighbours  
 e. NGOs  
 f. Other, specify.....
28. If yes, what did you do with the money? 1=no, 2=yes  
 a. Spent on food for personal consumption  
 b. Spent on food for household consumption  
 c. Spent on anything else than food for personal use  
 d. Spent on anything else than food for household use  
 e. Was given away  
 f. Used to pay debts  
 g. Was saved  
 h. Other, specify.....
29. On average how many meals do you have per day (including porridge)?  
 number: ..
30. Do you eat enough food?  
 1. No, mostly not  
 2. Yes, most time enough



31. Who prepares your food? 1=no, 2=yes
- Self
  - Spouse
  - Daughter (in law)
  - Son (in law)
  - Grandchild
  - Other relatives
  - Friends/neighbours
  - NGOs
  - Other, specify.....
32. Now I will mention some foods and I will ask you how often you eat them.
- 1 = never  
2 = occasionally  
3 = once a week  
4 = several times a week  
5 = every day
- maize
  - cereal staples other than maize (eg. rice, sorghum, millet)
  - non cereal staples (eg. plantain, cassava, sweet potato, yam, potato)
  - corn soya blend
  - pulses (eg. beans, peas)
  - (ground)nuts and seeds (sunflower/pumpkin seeds)
  - cooking oil
  - meat, fish, eggs
  - milk
  - dark green, bright coloured (red, orange) vegetables (eg. green leafy vegetables, tomato, pumpkin, avocado)
  - other vegetables (eg. cabbage, onion, aubergine)
  - bright coloured fruits (eg. mango, papaya, orange)
  - other fruits (eg. sweet banana)
33. If you have guests, can you offer them anything such as banana beer or sorghum beer?
- No
  - Sometimes
  - Always
34. Where do you meet people you can relax with? 1=no, 2=yes
- At home (guests or family members living with me)
  - At places of relatives/friends
  - Church
  - Market
  - HAI
  - Mass meeting
  - Other: ....
35. Do certain members of your family and/or friends come to you when they have problems or need advice?
- No
  - Yes
36. Are there people around you can talk to when you need?
- No
  - Yes

37. If you need help/assistance, do you have to pay for it?
1. No, never
  2. Sometimes/some people
  3. Yes, always
38. Are there people you can share your deepest feelings with?
1. No
  2. Yes
39. Do you have hope for the future?
1. No
  2. Yes
- XX. General impression of interview (reliability of answers):
1. poor
  2. moderate
  3. good

# Annex 5.10 Characteristics of individuals in the case study sub-sample

Characteristics	case 1	case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9	case 10	case 11	case 12
Sex	M	F	F	M	F	M	F	F	M	M	F	M
Age	70	98	74	76	66	74	77	62	76	93	86	80
Soc.ec. stat.	middle	poor	poor	poor/mod.	poor	poor/mod.	poor/mod.	poor/mod.	poor	poor	good	poor
Educ. stat.	uneduc.	uneduc.	uneduc.	rel. high	uneduc.	uneduc.	adult educ	poor	uneduc.	uneduc.	uneduc.	uneduc.
Nutr. stat.	moderate	poor	moderate	poor/mod.	moderate	poor	poor	moderate	poor	moderate	good	poor
Func. abil.	good	poor	good	poor	good	good	moderate	moderate	moderate	moderate	good	poor
Act. level	moderate	low	high	poor	high	moderate	moderate	moderate	moderate	moderate	good	low
Social support/ network	moderate	poor	poor/mod.	good	moderate	mod./good	moderate	good	moderate	poor/ moderate	good	moderate
Living arrangement	wife (43 yr), children	several younger adults	3 young orphans	daughter (25 yr), gr.children	daughter (22 yr), gr.children	wife (72 yr)	alone	grandchild (18 yr)	wife (65 yr), son (24 yr)	wife (43 yr)	several younger adults	wife (78 yr), gr.children

## Annex 5.11 Case study protocol

### NUTRITION RESEARCH CASE STUDY PROTOCOL

#### Instructions

This is an open interview which means that the questions are open ended and the respondent is given the freedom to answer how he/she prefers (we do not have answer categories or structured data forms). The questions below provide some guideline and remind you what topics to cover. Make concise notes of the respondent's answers and any observations and/or comments during the interview and elaborate as soon as possible afterwards. Take enough paper (and other necessary material) for your recording and to do the ranking exercises. Stop as soon as the respondent gets tired and make an appointment for the next visit to continue the interview.

#### Introduction

Explain the purpose of this visit (and next visits), ask permission, assure confidentiality.

#### 1. Household composition table

Complete table with, relationships, sexes, ages, educational levels (income and work comes later) of family members (living with the subject in the blende). Also ask whether there are other relatives in Chabalisa (or in the proximity), not living with the subject, and record the relationship, sex and age.

#### 2. Biography

I would like to get to know you better. Could you tell me about your life and the stages, events and people that have been important to you? I would like to hear about your life from childhood, upbringing and schooling, marriage and children, working life, retirement, widowhood, your flight to Tanzania and your current life in Chabalisa.

Points of attention:

1. place of birth
2. religion
3. how was early childhood, family life, parents, siblings
4. when did you get married, circumstances of early married life, children
5. migration
6. working life, retirement
7. bereavement, if widowed: how long has it been since the death of your spouse
8. what were the most important/memorable times, events, people in your life

#### 3. Observations on subject, blende and surrounding

#### 4. Activity pattern

How does a normal day look like? How do you normally pass your days? Points of attention:

1. What time do you get up, have meals, go to bed?
2. What are your activities at home (budgeting, managing accounts, child care/play, informal education, cleaning, washing clothes, doing repairs, food preparation, washing dishes, gardening, handicraft)?

3. What are your activities/work outside (collecting water/fire wood, work in villages, cultivation on "own" plot of land, food collection/purchase, marketing, going to church/mill)?
4. What are your social activities, how do you relax (visiting relatives/friends, going to meetings/bar/HAL/party, doing voluntary work, wandering around/doing nothing, games)?
5. When do you rest?

If most days are the same, a time line can be made showing all activities from getting up to going to bed.

Ask the respondent to indicate (with beans/stones) the relative amounts of time spent (per week) on the various activities. First ask on which activity the respondent spends most time (give many beans e.g. 10) and which take least time (1 bean). Compare all other mentioned activities one by one to those already discussed.

#### **5. Fire wood**

1. Where do you get fire wood? Distance?
2. Who usually collects fire wood for the household? How often?

#### **6. Food purchase**

1. From where do you get the food you eat? (e.g. the distribution (TCRS), your own production (kitchen garden or other land), food for work, own purchase, exchange, gift (from relatives/friends), any other) What proportion comes from where?
2. Respondent indicates relative amounts with beans. Record after completion.
3. Who decides what foods are prepared in your household? Are you consulted in decisions about the diet?
4. Do you get any types of prepared/ready made food or beverages from outside (bought or given)? If yes, what types of food/beverages? How often?

#### **7. Food enjoyment and appetite**

1. Under what circumstances do you really enjoy your food? (e.g. when eating with family members, when feeling hungry, when food is given when having appetite, when eaten preferred foods etc.)
2. When do you not enjoy your food? (e.g. when worried, ill, alone, when having abdominal pain, when I eat food I do not like, I have lost interest in food, when food is given at odd times etc.)
3. When do you feel that you have eaten well?
4. How would you describe your appetite? (poor, fair, good, very good)
5. Which hour/time of the day do you feel most hungry?
6. Are you able to get food when you feel hungry?
7. Have you noticed any change in your sense of taste as you have got older? What has changed?
8. What foods have an odour/smell that is pleasing to you? Has it always been like this or is this since recently?
9. What foods have an odour/smell that you dislike? Has it always been like this or is this since recently?
10. Are there any foods that you try to avoid? Why?

#### **8. Fasting**

Do you ever fast? If yes, why, when, for how long, when did you start to do so?

### 9. Food practices and patterns

1. Do you feel that there is enough food for the family? (always, sometimes, never, not for everyone)
2. Do you feel that you are getting all the food that you require/need? (always, sometimes, never) If no, why and what is lacking?
3. Is your food cooked separately? Why?
4. Do all family members eat from the same bowl or from their own plates? Was this the same in Rwanda?
5. If all family members are at home, do you eat at the same time or do some eat first and others later? Who eats first/last? Why? Was this the same in Rwanda?
6. Do you ever miss a meal? Why? (when ill, asleep, not at home at mealtimes, when I do not like the food etc.)
7. What happens to remaining cooked food that is not distributed (still in pot, untouched)? (recooked for particular family member, recooked for whole family, served cold for particular family member/ whole family etc.)
8. What happens to any leftover food (food left on the plate)? (given to particular family member, given to animals, thrown away etc.)
9. Is food ever thrown away? Why?

### 10. Intra-household food distribution

1. Do you think there is a preferential distribution of food according to age in your family? Why?
2. How are individual special needs according to physical condition considered in the food distribution in your family (are people's different sizes, activity levels, special needs such as in illness, childhood, pregnancy, lactation, old age considered)?
3. In case there is not enough food cooked to satisfy all family members, who eats less than (s)he would have liked to?
4. Are there any foods that you feel your family does not let you have anymore? Why?
5. Are there any foods that are given especially to you/only to you? Why?

### 11. Alcohol

1. Do you ever drink beer (banana, maize, millet) or spirits (distilled beer)?
2. When did you start drinking alcohol?
3. How many years of your life have you been drinking alcohol?
4. How often do you drink alcohol? How much do you drink at one time?
5. Do you drink more/less than in the past? Why?
6. Why do you drink (thirsty, appetiser, sleep, socialising, to forget problems etc.)?
7. Do you think alcohol is good/bad for one's health? Why? How much is good/bad?

### 12. Income and expenditure

1. Complete the household composition table with sources of income of all family members (how do they bring money into the household: work in village, handicraft, trade, self employed in camp (e.g. carpenter, mason), job with NGO etc.) and explain what kind of work/job is done.
2. Then ask the respondent to do an expenditure ranking. Ask on what main items the household spends money (e.g. food, mill, fire wood, clothes, school uniforms, housing, health, alcohol, tobacco, social obligations like marriages and funerals) and let the respondent indicate the relative amounts with beans (start with the maximum and minimum).
3. Who keeps the money for household use?

4. Who in your family decides about financial issues?
5. Do you keep your own pocket money for personal use? If yes, how do you get it (from work, from the money keeper in the household)? How do you spend your pocket money?

**13. Sense of well-being and health**

1. How is your health compared to as it was just before you fled?
2. Are there things you cannot do any more because of your health? Does your health stand in the way of you doing things you want to do?
3. Do you have difficulty with sleep? Why?
4. Do you find you are sleeping too much?
5. Have you lost interest in things you usually cared about or enjoyed?
6. Do you enjoy music regularly e.g. listening to the radio, traditional dancers, singing favourite tunes/children's songs/religious songs?
7. Observe the subject's mood.

**14. Personal relations and concerns**

1. How are your relationships with your family members? With whom do you have the closest relationship in the family?
2. With whom do you have the closest relationship outside the family?
3. Are you satisfied with your involvement in the family? Why?
4. Do you feel satisfied by the respect shown to you by the people around you?
5. How do you feel about the attitude of the younger generation towards elderly people?
6. How satisfied are you with your present life? Why?
7. At this point in your life, what is your main concern?
8. Are you worried about the future?

## **Annex 6.1 Summaries of the case studies**

### **1. Mr. Karangwa, 70 years**

Mr. Karangwa lived with his wife (43 years) and three daughters (7, 5, 3 years) in a plastic roofed blende with walls made of clay. He was tall and slim and looked quite fit for his age. His wife was plump and was six months pregnant. This was the second marriage for both of them: Mr. Karangwa's first wife died from mental illness and his current wife separated from her first husband. Four children from his previous marriage also lived in this camp with their families and another three children stayed in Kagenyi camp. The children visited him every now and then. Mrs. Karangwa used to work for food in Tanzanian villages while Mr. Karangwa stayed at home and did some work in the garden, but due to her pregnancy she had not been out working since three months.

Mr. Karangwa was born in Rwanda and lived with his parents, grandparents, uncles and their wives. As a child he took care of cattle and smaller animals like goats and chicken. When he was about 20 years old, his father died and his mother remarried outside the clan and left him. He continued to live with his grandfather for about 10 years until he died as well. Mr. Karangwa said from that moment on he considered himself to be an orphan: although he lived with his uncle, he was no longer treated well. Due to the situation at home, he decided to go to Uganda and work on farms to earn money. After several years he returned to Rwanda with enough money to start a new life. He married his first wife and they "were blessed with three sons and four daughters". Sadly his wife became severely mentally ill and therefore he was permitted by his father in law to marry his present wife. His first wife died two years later. At that time he inherited his father's possessions like farms, houses and cattle and continued cultivating coffee, plantain and other food crops on his own farm. As his herd was expanding while land was becoming scarce, he feared for overgrazing and erosion. Therefore he decided to sell the cattle and cultivate sweet potatoes, yam and vegetables instead.

When asked about memorable events in his life he mentioned as extremely sad events the death of his first wife and the civil war in which he lost a son. Looking back at good times, he remembered the time of his first marriage when he got many children and had many friends. It was a period of harmony and peace in Rwanda when Hutus and Tutsis



lived together as brothers and sisters. Mr. Karangwa said that the devil came between them but he also explained the war from a political point of view. Those who were thirsty for power, set up ordinary people to fight against each other. Comparing his life in the past in Rwanda with the current life in exile, he described the current situation as tough and difficult. "Although we are safe here and being cared for, we only have basic things. We miss variation in our meals and important foods like milk and beer and we suffer from diseases like scabies."

A typical day for Mr. Karangwa looked as follows:

In the morning he chopped firewood so that his wife could make a fire in the kitchen area just outside their blende to prepare porridge. After drinking porridge he went out to visit friends and returned before lunch to rest for a while. After lunch<sup>1</sup> he visited friends again and did some work in the garden and fetched water. He used a small jerry-can as he could not carry a big one. Besides the kitchen garden, the family cultivated a plot of land just outside the camp, given to them by a friend from a local village. In the evening he walked around a bit and washed himself outside after darkness<sup>2</sup>. He only took a small meal before going to bed to avoid abdominal discomfort.

Before the pregnancy, firewood was collected by Mr. Karangwa's wife together with a boy to help her. She would leave at 7 a.m. and return at about 11 a.m. with a stock lasting for three days. If she went for some consecutive days, the stock would build up and could dry before usage. They currently bought firewood for TSh. 400 per week (approximately 20 kg).

Mr. Karangwa estimated that about 50% of their food came from the general distribution, 30% from work in local villages, 10% is bought at the market and 10% is own produce. He decided together with his wife what food to prepare. He preferred a meal of plantain, beans and vegetables (with meat), however he also enjoyed thick maize porridge with fried beans and vegetables. Maize grain gave him stomach ache. He did not enjoy food when he fancied beer, but he often could not afford to buy it. On the contrary, he has good appetite after having beer (he used to have a bottle (70 cl) twice a week but

<sup>1</sup> When it is raining and firewood is moist, they eat porridge again for lunch.

<sup>2</sup> Most adults bathe in darkness for privacy reasons.

stopped drinking when his wife stopped working in the village). Whether or not he can afford to buy beer depends much on income earned by his wife.

The family usually ate together. Mr. and Mrs. Karangwa ate similar quantities. Now Mrs. Karangwa was pregnant, she could only eat small quantities at a time, but she did not compensate for this by increasing the number of meals.

Mr. Karangwa made the following estimation of the household's expenditure (in descending order):

1. Food.
2. Hiring tools (they hired<sup>3</sup> tools to cut firewood for TSh.100 twice a week and a basin for washing clothes for TSh.50 twice a week (market price TSh. 900)).
3. Beer (TSh.200 a week).
4. Mill (TSh.200 a week).
5. Soap.
6. Firewood (sometimes TSh.400 per week).
7. Clothes.

According to Mr. Karangwa, his wife kept the money and gave him whenever he needed something. He made financial decisions but always consulted his wife.

Mr. Karangwa said he was in worse health compared to pre-war times. In Rwanda he was still working on plantain and coffee plantations, but now he only did some gardening. He could not even dig the earth or carry heavy weights. He thought his health could improve if he would get beer and plantain daily.

Although he felt respected by his wife, children and neighbours, he observed a general decreasing respect for the older generation. Today's young generation is less obedient and helpful and are focused on things that bring immediate profit, leaving little authority for parents. It seems that authority is shifting from parents to institutions like schools, local government and agencies.

## **2. Mrs. Mukakibibi, 98 years**

Mrs. Mukakibibi was an old widow who lived with her last born daughter (59 years), a granddaughter (26 years) and her two children (6, 3 years) and an unmarried grand-

<sup>3</sup> He commented that in Chabalisa 1 people lend each other tools and utensils without asking money.

daughter (21 years). The daughter and granddaughter were also widows since the war. They had two poorly constructed blendes adjacent to each other: one was for Mrs. Mukakibibi and the other for her daughter, the granddaughters and children. The room was partitioned with a curtain into a "sleeping room" at the rear where a few belongings like clothes, utensils and a sack of cereal were scattered, and a "living room" with a mat on the floor. At a later visit there was a wooden bed that her daughter had made for her recently. There was a common cooking place and kitchen garden for the two blendes.

Mrs. Mukakibibi had another daughter living not very far from the camp (four other children had died) who married a Tanzanian husband long before the war and lived in Nyambo village. She came to the camp twice and brought Mrs. Mukakibibi milk. At that moment this daughter was very ill. While her younger sister was visiting her, she fell ill herself and was admitted to Nyakahanga hospital for three weeks. She was only discharged recently. When Mrs. Mukakibibi's granddaughters went to visit her, they first needed written permission from UNHCR and then walked six hours (one way) and returned the same day.

Mrs. Mukakibibi was a moody and stubborn woman who needed a lot of encouragement to talk. She told us she was born in a well to do family in Kigarama commune. As a child she helped her parents with household activities, making mats, baskets and finding the raw materials. Her marriage was arranged when she was about 16-17 years old. She explained that in those times, children had nothing to say but to obey their parents and getting a good husband was a game of chance. She remembered her parents and in laws negotiating the dowry while drinking beer. She was fortunate to be married to a rich husband who was polite and never ill-treated her. They had three sons and three daughters. Sadly the second, third and fourth child died at a young age which made Mrs. Mukakibibi very worried about the survival of the two youngest. Therefore she decided not to spend money on their education but keep them at home to work. Her husband died after a long unknown illness when their youngest child was about two years old. After his death she decided she wanted to be baptised in the hope she would find new happiness. However "my prayers were not heard and I lost my faith".

According to Mrs. Mukakibibi she was rich before the war broke out. She owned many resources and had enough food to feed her family and labourers, although the situation was not as good as before her husband's death. "When I think of Rwanda, I get a horrible feeling and my heart starts to beat fast". To her this indicates that there is still no peace in Rwanda. "I will never forget the catastrophe of 1994 when human beings became like animals."

Mrs. Mukakibibi described her main activities as sleeping and drinking porridge. When she got up around 10 a.m. she liked to sit in the sun or, when there is fog, near the fire. Her granddaughter prepared her porridge in the late morning after which she went back to bed. She got up again around 4 p.m. to eat stiff maize porridge with a bean sauce that the others left for her from lunch time. "I prefer to eat alone, I cannot keep up with the pace of the others, I do not have teeth." She went back to sleep early in the evening. "I cannot concentrate anymore, I only want to sleep. I get tired very soon and have no tolerance."

According to Mrs. Mukakibibi they only ate food from the general distribution and some vegetables and beans from the kitchen garden. "We only eat small quantities and when the food is finished we only have vegetables. Then I am the one who suffers most when I do not get my porridge and have to eat untasty vegetables." Mrs. Mukakibibi and her daughter looked very thin and had skin rashes in contrast to the granddaughters and grandgrandchildren who looked healthy. Every now and then she asked us for beer or food. "I am preparing myself mentally to die. You can see that I get worse day by day."

Last month Mrs. Mukakibibi received supplementary food (dried fish, rice, beans, oil) from Memisa when she attended the clinic for scabies. This was boiled separately for her and she said she was feeling better at that time. She did not understand why Memisa "abandoned" her. She avoided cooking oil because she did not like the odour.

According to Mrs. Mukakibibi they had no income sources. "My daughter got badly wounded up to the bone in the war and cannot work hard any more. My granddaughter is still breast feeding so she cannot go to villages." However the interviewers had the strong impression that both granddaughters did generate some income.

Her daughter (whom she sometimes calls mother) seemed to treat her well, talking politely and giving moral and physical support. However the granddaughters could be quite nasty and pay little attention to her. "I feel lonely when my daughter is not around".

The poor relationship with her granddaughters was illustrated by a sad story that Mrs. Mukakibibi narrated. It was said that her nephew had stolen money in Chabalisa I and was being hunted. He fled to Mrs. Mukakibibi's blende and when he was found there by his persecutors he was beaten up and Mrs. Mukakibibi's bed was destroyed in the fight. Mrs. Mukakibibi's daughter decided to pay the money back with a loan from the women's association of which she was a member. When she went to her sister in Nyambo village to get money to pay back the loan, she found her ill and also fell ill herself. It was only when she came back from hospital that she repaired Mrs. Mukakibibi's bed, while the two granddaughters had been around all the time. When one of the granddaughters overheard Mrs. Mukakibibi disclosing this, she yelled: "Who told you to tell them the whole story? Don't you feel ashamed of yourself?!"

### **3. Mrs. Mukakalisa, 74 years**

Mrs. Mukakalisa was a childless widow and lived with three orphans (10, 6, 3 years), her sister's children. When their parents died in the war in Rwanda, Mrs. Mukakalisa fled with the children to Tanzania. The eldest child used to go to school in the camp. However since a month she worked in a local village with a farmer's family where she earned food and clothes. Mrs. Mukakalisa now only had to feed three mouths while she continued to receive food rations for four which made life a bit easier. She had not seen the girl since she left but the farmer's wife promised to take care of her.

Their blende was a poorly constructed small wooden frame with a plastic sheet on top and walls made of grasses. There was one wooden bed with a mat and blanket on it and only very few other things. She explained that HAI constructed this blende for her. The roof was leaking so she had to go to the neighbours when it rained.

Mrs. Mukakalisa had good memories of her childhood. Her parents owned some cows so they had milk and good food and life was not too difficult. She used to do household work like fetching water, helping in cultivation and caring for her six siblings. As first

born, the parents' proof of fertility, she was loved by her parents and got new clothes that were later used by her sisters. She regretted she had never been to school.

At the age of 18 Mrs. Mukakalisa found out that the time had come to get married when her parents bought banana beer from the neighbours and said that was because she was going to marry a boy from the village. Mrs. Mukakalisa was afraid. Her parents had given a plot of land where her husband had to build a house before the day of marriage. As they did not know each other it was difficult to live together during the first month of marriage, but later they became friends. They cultivated the land together and Mrs. Mukakalisa prepared food and made mats. They did not have cows, but they received milk from their parents. Mrs. Mukakalisa told us she was not very happy in married life. Her first child died during delivery and from that time on she always had pain in the lower abdomen. Many years later she underwent an operation in Kigali and the pain disappeared, but she never became pregnant again. Initially her neighbours neglected her, but later they became a bit milder and said it must have been God's will that she remained childless. However she always felt a bit different.

Many years later her husband took a new wife for whom he built a new house. Mrs. Mukakalisa did not have problems with that: her husband continued caring for her and divided the land. She got more than half as she was the first wife and had always cultivated it. Economically and socially the two households were completely separated. The husband stayed, worked and ate alternately two days with his first wife and two days with the second. He got children with the second wife, but they did not see Mrs. Mukakalisa as a second mother.

Her husband was killed at night during the war with his second wife and all children. Only villagers who stayed that night in the bush had survived including Mrs. Mukakalisa. The next day she walked five hours to reach her sister's village and found out that she and her husband had been killed two weeks earlier. Their three children stayed with the neighbours who immediately gave them to Mrs. Mukakalisa. She took them to her own village and from there she fled with neighbours to Chabalisa, a journey that took them four days. Initially she lived in Chabalisa I surrounded by people of her own commune, Rukara. As she was ill at the time the neighbourhood was moved to Chabalisa II, she

moved later and ended up between people from Kigarama commune. This was not easy in the beginning, but later she and the neighbours became good friends and they lend her utensils.

Mrs. Mukakalisa said she was quite happy to live with the three children: "They are mine because they are my sister's children". Nevertheless it was not easy to take care of them. As the food was not enough, Mrs. Mukakalisa planned daily rations to avoid running out of food long before the next distribution. If soap was distributed she washed the children and clothes with soap, otherwise just with water. She had difficulties walking far to collect firewood (four hours) so she only did that occasionally and often cooked beans for two days to save wood. Every now and then she collected fresh wood nearby and sometimes the neighbour's children gave her dry firewood. "My neighbours are good, they also give my children food when our food has finished<sup>4</sup> or when I am ill".

Mrs. Mukakalisa usually got up around 8 a.m.. She first swept the floor in and around the blende and fetched water before she cooked porridge. Then she washed the dishes, collected water again and prepared a lunch of stiff maize porridge and beans. After lunch she rested for a while if the weather was hot. Then she prepared dinner and bathed the children before they had dinner (she only ate liquid porridge because she usually had an uncomfortable stomach at night as the food was always the same<sup>5</sup>, but the children ate stiff porridge and left over beans and vegetables from lunch). Thereafter the children went to sleep and Mrs. Mukakalisa still chatted a while with the neighbours. She sold cooking oil to mill maize every fortnight and if oil was not distributed she borrowed some money from the neighbours. Mrs. Mukakalisa also worked in HAI's communal garden once a week. They harvested three times a year and then she got two shares. She further cultivated some vegetables in her kitchen garden, but this was only enough to eat vegetables every other day in the season. She mentioned herself as the first person to eat less when there is not enough, but she thought that the children were getting sufficient because she normally made them porridge if she had not cooked enough.

<sup>4</sup> They only gave food to the children, not to Mrs. Mukakalisa.

<sup>5</sup> When she really got fed up with the food she only ate porridge for a few days.

Mrs. Mukakalisa used to drink beer (plantain or sorghum) in Rwanda. She started to have half a bottle at lunch time after she had been married for a while. She explained that parents always tell their children (especially girls) not to drink before they are married as this would cause forgetfulness, learning difficulties and bad behaviour. In the camp she never drank beer. She had no source of income other than selling oil from the ration. Her only expenditure was on the mill and maybe every two months she would buy some plantain to cook a tasty meal.

Mrs. Mukakalisa said that her health was worse than before the war due to the bad food. She also got dysentery upon arrival in the camp and since that time she was no longer able to do heavy agricultural work and therefore could not work in local villages. According to Mrs. Mukakalisa, she had the closest relationship in the camp with the neighbours. She felt respected by them because they help her out. Regarding the younger generation she remarked that their attitude towards older people depends on how they were brought up by their parents and at school. She noticed that children who go to school behave better at the water tap, they help older people and give them priority. "But bringing up children is not easy, she sighs, I do my best but my daughter who is now in the village also did not really want to help me with cleaning."

#### **4. Mr. Rwabuhungu, 76 years**

Mr. Rwabuhungu lived with his daughter (25 years) and two granddaughters (17 and 4 years old) in a small igloo-type blende. Behind the blende was a relatively large kitchen garden with millet, sunflowers, vegetables and maize. On our arrival we found his daughter lying on a mat with malaria. Mr. Rwabuhungu was a short and thin man, wearing a heavy sweater and shabby trousers. He walked very slowly, using a stick and spoke with a hoarse voice. We understood he suffered from asthma and chest and joint pain. The asthma was a long-standing problem that started in Rwanda when he was still relatively young. He told us that his wife and three children died in the genocide as well as grandchildren and other relatives.

Mr. Rwabuhungu was born in Kigarama commune. In those times children who went to school started quite late. Before he started his education, he used to help his parents with household chores and looking after small livestock. Later his parents sent him to work



for a wealthy Tutsi farmer in exchange for a cow. "I had to work like a slave", according to Mr. Rwabuhungu. After a year he returned home and told his parents that he wished to study. His parents agreed and applied for him at a missionary school. After he was accepted, his younger brother was sent to the Tutsi farm to replace him. He started school and was baptised when he was 13. This was an important event as "I received God's grace and blessings which protect me and teach me the life of love". He remembered well that he started as a catechism teacher for the Anglican church in 1938. Later he was transferred to Rukira commune where he was the first catechism teacher. He continued teaching in several places until 1986.

He married in 1946 and his wife had a similar educational background. It was a harmonious marriage and seven children were born. After marriage his wife became a housewife, but she replaced him as a teacher whenever he was ill. After work he helped his wife cultivating plantain, coffee, sweet potatoes and vegetables. They had five cows and 20 goats and were fairly wealthy.

Unfortunately everything was destroyed when soldiers ambushed their village on 21 May 1994. He remembered that day very well when he lost nearly all family members. He escaped because he was unconscious and the soldiers had left him for dead, but he woke up and hid himself in the forest. After this first attack, the bandits returned several times to the village to kill survivors. Mr. Rwabuhungu was hunted unsuccessfully for four days. His eldest son also survived as well as his daughter and two grandchildren. However he did not want to flee to Tanzania with them as his health was poor and he would be a burden for them during the journey. Thus his children and grandchildren left him behind, but later his son returned to pick him up. It was a distressing three week journey through bushes and thick forests. The flight exhausted Mr. Rwabuhungu so much that, as soon as they reached Tanzania, they had to stay in a village to regain his strength. After two months they decided to join their relatives in Chabalisa. Besides his son and wife with seven children, an uncle and aunt with their family and a brother of the aunt with his family also lived in Chabalisa II.

Mr. Rwabuhungu said: "I'm still thanking God for having survived, although I've been in danger so many times. I'm very happy to have arrived in Tanzania despite the long

journey. I also thank God for providing us the people of Tanzania and relief agencies that help us to survive and give us hope. However I have to warn you as an experienced person working with organisations and foreign people. You do good to address us, but I've seen so many times that upon completion of a survey nothing seems to happen. We are told that reports will be written and given to the responsible persons, but if you are genuinely devoted to us poor people, you need to provide assistance quickly. Look, we are in need of clothes and I know that some influential people can find us second hand clothes at low costs in nearby regions. It hurts when all we get is nice words".

Mr. Rwabuhungu's daughter did agricultural and household work in Tanzanian villages. Also his eldest granddaughter who attended school, sometimes worked in village households but she stayed at home quite often when Mr. Rwabuhungu's daughter suffered from malaria. The two of them went out twice a week from 7 to 12 in the morning to collect firewood. Until six months ago Mr. Rwabuhungu used to collect a weekly ration from Memisa's feeding programme (soya mixed with milk and sugar). Nowadays Memisa's home visitors brought him asthma medicines and sometimes food at home. He used to enjoy walking around and watching peoples activities, but he found it increasingly hard to get around. Also the people from church nowadays visited him at home. His son came every week and always brought food or money.

Mr. Rwabuhungu usually woke up with the sun so that he could warm himself. After washing his face he was given porridge. Then he checked the garden and read the bible until lunch time. After a lunch of food that is easy to chew, he slept for a while and in the afternoon he read the bible again. He had become very slow in reading due to his poor vision. He also had sleeping problems due to his asthma and memories of the tragedies. In total he lost 75 relatives he used to know well since they lived on the same compound. Occasionally he was able to cheer up when the church choir visited him and people gathered to sing religious songs. Despite his health and other problems, Mr. Rwabuhungu was a patient and friendly man who often smiled.

The family got food mainly from the general distribution, from work in villages and from Mr. Rwabuhungu's son. Vegetables and sunflowers came mostly from the kitchen garden and sometimes they bought food from the market with cash from selling oil or from their son. Mr. Rwabuhungu told us that coldness greatly affected his asthma and his appetite

was much better when the weather was warm. Although he used to like beans, sweet potatoes and peas when he was young, he no longer ate it as it seemed to worsen his chest pain. He preferred a meal of plantain, groundnuts, a meat relish and porridge, however they could rarely afford such a meal. His food was sometimes cooked separately, for example the ration from Memisa. If preferred food was obtained, he and the youngest granddaughter were given priority.

Mr. Rwabuhungu used to drink beer before he reached the age of about 15. Then he stopped drinking as he felt that a genuine Christian should avoid this sort of temptation that can lead to immoral behaviour. He believed that alcohol affects the purity of the soul and that it causes quarrels in families.

Mr. Rwabuhungu's daughter kept the household money and made decisions on financial issues. At times she consulted her father. Mr. Rwabuhungu once received money from the pastor of the Lutheran church and decided to spend it on the household. According to Mr. Rwabuhungu, they spent most money on the mill and on buying food. Only small amounts were used for kerosene (to lit firewood), firewood, clothes, medicines for his daughter and soap.

Mr. Rwabuhungu felt respected by the people around him. Many people visited him and took his advice. Also when misunderstandings occurred between his daughter and eldest granddaughter, he was usually able to reconcile their differences. Regarding the attitude of younger generations towards the elderly he mentioned that he had no complaints since he is being visited and assisted but he realised that this is much harder for young people without income. Their attitude may be different. In his opinion young people are generally struggling to survive in the camp and care for those in need by working wherever they can. Thus they are trying to maintain respect. However they are seriously restricted by rules and regulations regarding mobility and therefore forced to concentrate on themselves even though they may want to help their parents. For instance for the construction of a stable blende one needs timber that comes from forests far away that are forbidden. It is quite dangerous to go there and one may take the risk once for oneself, but not for others.

Furthermore the behaviour of young people of today also depends on how they were brought up. He noticed that in educated families children seem to be brought up with good manners. In uneducated families however, rearing patterns depend more on social control. In the camp situation there is less social control than there used to be at home as many people spent much time working in Tanzanian villages, fetching firewood etc. Thus children spent less time with their parents or with other adults. Therefore events like teenager pregnancies occurred more frequently than before the war. Also when the children's economic status became better than that of their parents<sup>6</sup>, parents often had less say over them.

Mr. Rwabuhungu was concerned about the refugees' behaviour. "They have the habit of moving around and outside the camp to get food, money and other necessary things but this is against the rules and it has caused tensions with the local population. If they continue like this the Tanzanian authorities will become even stricter and it will increase our hardship."

He also worried about his health and entering old age in a poor situation, lacking things such as land, good shelter, warm clothes, good food and medicines. He wondered what would happen to his children in this environment if he died. He sought relieve in reading the bible and praying that the Rwandese may soon be rescued from exile and that peace loving leaders may be restored instead of the selfish politicians who "want to eat every treasure of our country".

### **5. Mrs. Mukandengo, 66 years**

Mrs. Mukandengo was born in Tumba commune, Buymba prefecture where the war started. Her younger sister and herself were loved by their parents because they were the only children who had survived (other children died at young ages). She remembered her youth as a happy period and she used to help her parents in cultivation, sweeping the floor, collecting materials for mat making and fetching water and firewood. "I was fine with my parents. Nowadays life is hard, but I thank God for sending white people who give us food, utensils and the like."

<sup>6</sup> This did not happen as often as in Rwanda as parents there used to own properties like the house, land and livestock.

Mrs. Mukandengo's father died of an unknown illness when she was about 15 years old. Five years later it was decided it was time for her to get married. She said smiling: "The boy's parents bring beer to the girl's parents and from that time on you know you have to run away when you happen to meet your husband to be or his relatives". It was a custom that a girl was not supposed to be seen by her in laws before the marriage. "I couldn't eat as I was scared to get married, I didn't know my husband. Neighbours would even make me more worried, but married women came to explain what was going to happen. The day of the marriage was wonderful, I was treated like a queen!" She married in Kigali prefecture but apparently didn't find it very difficult to leave her mother as "parents in law treat you as their own child, especially in the beginning". As a new wife she mainly worked in the house at first so that people could pay a visit and get to know her. "Later on I used to cultivate until the war broke out".

When Mrs. Mukandengo's mother died of malaria ("old people easily die of illnesses"), her sister came to live with her. This happened before Mrs. Mukandengo delivered her first child. She gave birth to ten children of whom five died in the war with their families. Mrs. Mukandengo and her husband enjoyed a happy marriage and were able to send all children to primary school. After the children had married, they lived with three grandchildren. They used to deal with agricultural labourers, cultivate in the mornings and made mats and baskets in the afternoons. The grandchildren helped them with household chores such as fetching water, firewood and cooking. A daughter lived at a few kilometres distance.

Then the war broke out and they had to flee from their house and hide in the bush several times. One day Mrs. Mukandengo's husband and her grandchildren didn't return to the house. When she was told they were killed she immediately fled to the border (that is formed by a river) with the neighbours. There was a ferry operated by Tanzanians for which refugees had to pay. Those without money were left behind or they paid with belongings left behind by others. She was very lucky as she got a boat immediately: as soon as they reached the other side (Tanzania), soldiers appeared and killed all people who were waiting for the boat to return. They ran away in all directions, in panic that the soldiers would cross the river.

After 30 hours of continuous walking, Mrs. Mukandengo arrived alone in Chabalisa. She got her own plot but was registered on the same card with people she didn't know. This meant that, for distribution purposes, they were treated as a family. They were given maize, beans, a plastic sheet, a cooking pot, a bucket, a jerry-can and cups. Mrs. Mukandengo stayed on her plot without a blende and got dysentery that made her incontinent. Fortunately the other people constructed a small blende from grasses and she stayed with them. She took traditional medicines and got better after a month. It was an awful time. There was no water, the place was covered with excreta and on top of that they had to eat maize grain. Since they were one of the first batches of refugees to arrive, firewood could still be found nearby. They used to collect water from a stream in a Tanzanian village, but only after the local people and if they paid TSh. 50. In the beginning refugees also demanded money from each other. Some people would demand TSh. 50 for lending a pounding block to neighbours. Gradually the situation improved and it became like it used to be in Rwanda.

Since there was tension between Mrs. Mukandengo and her "housemates", it was a relief when - after more than a year - she was able to buy a second hand plastic sheet for TSh. 3,000 (saved by selling cooking oil) and was helped by neighbours to build an igloo-type blende (a wooden frame covered with grasses and a plastic sheet on top). The plastic sheet of the old blende was divided and neighbours gave her another small piece of plastic that could serve as a door. There was not much more in the blende than a bed (a mat on grasses) and some firewood, utensils, food and clothes. "When the wind is strong I'm scared it will collapse and I don't stay in. Now I've managed to flee from Rwanda, I don't want to be killed by my blende."

Mrs. Mukandengo's daughter arrived later in Chabalisa after having lived in local villages for a while. However Mrs. Mukandengo did not move to her daughter's place as it is unusual in Rwanda to live with a married child, particularly with a married daughter. A month ago Mrs. Mukandengo's daughter came to stay with two sons of 4 years and 3 months old. The daughter had marital problems and stayed with her mother for a while so that her husband would not bother her. She was the third wife of her husband who was rich enough in Rwanda to have three families. The three wives had their own blendes and the husband stayed with them alternately. Mrs. Mukandengo said: "I was

never keen on this marriage, but if they love each other you cannot stop them". The daughter was planning to go back to her own blende soon.

Mrs. Mukandengo's daughter helped her mother while staying with her. Otherwise Mrs. Mukandengo took pride in caring for herself: "When I meet young people while fetching firewood they ask me if I have nobody to do it for me. I tell them I'm alone and still able to do it myself!" Since the new distribution system was introduced (distribution to groups of families instead of to individual families), food was collected by younger people. She went out two mornings per week to collect firewood and one morning to work in HAI's garden. She did the laundry, a heavy job that took a long time, once a week and every three weeks she washed her Sunday clothes to go to church. Once a month she went to the mill, but with the new distribution system, maize meal was more often distributed instead of grain. Of the daily tasks, Mrs. Mukandengo reckoned that food preparation and resting, sitting or talking required most time, even though she prepared beans for two days at a time. After these came successively fetching firewood and water, gardening and sweeping. The neighbour, also an older woman, helped her to wash her back. This neighbour and Mrs. Mukandengo's daughter took care of her when she was ill.

According to Mrs. Mukandengo, she mainly ate from the general distribution. Occasionally she got plantain from her daughter who worked in the village several mornings per week. "Then I can't wait for it to get ready and start eating straight from the cooking pot!" She used to sell part of the maize grain to buy plantain, sweet potatoes and cassava and milled the rest to prepare ugali and porridge. This used to be just sufficient if she prepared modest quantities. "I always divide my food carefully until the next distribution so that I never run out of food all together. The distribution is like the harvest in Rwanda, the size of meals before are smaller than after. But I cannot say that I don't have enough because I still don't need to steal food." However as the price of maize grain had gone down (from TSh. 80 to 20 per bucket) since the introduction of the new distribution system, it was no longer worth it to sell maize grain.

Thus she milled<sup>7</sup> all grain from the general distribution (she avoided eating whole grain maize since she had dysentery) and ate ugali and beans. At the moment they received peas and lentils instead of beans which nobody likes. If she was tired of ugali, she only ate porridge. Although there was more to eat in terms of quantity (selling maize for other food reduced the amount of calories), her appetite was less. Her diet had become less varied, only her daughter's gifts provided a change.

Mrs. Mukandengo ate vegetables from her kitchen garden and sometimes she got some from her neighbour. "When I get plantain from my daughter, my neighbour gives me some vegetables so that I can prepare a proper meal". The HAI garden provided her with some as well. Mrs. Mukandengo sometimes had a meal at her neighbour's place or she invited her neighbour over. This was purely for social reasons, not to reduce the work load or use of firewood: if the neighbour came for a meal she still had to cook at home for her grandchildren. She enjoyed eating when she was with her neighbour or daughter.

Mrs. Mukandengo often did not feel well because of malaria or abdominal pain. She said: "Abdominal pain comes at any time and sometimes I even feel worms from my stomach coming up to my throat or nose". This was a recurrent problem although she got tablets from Memisa that gave relief for a while. "I also go to the clinic for malaria. I make sure I go there before it gets too bad to go alone. In Rwanda I was still strong, I ate good food. Since the dysentery I look like an old woman, I feel ill, weak, dizzy and I'm cold in the evenings so I go to bed early. Even if I had land, I wouldn't be able to cultivate it properly. "

Mrs. Mukandengo usually ate three meals per day, but omitted meals if she was ill, had abdominal pain or when she was fed up with the monotonous diet. "Nobody likes the peas and lentils they are distributing nowadays. If I don't mix peas with beans, the worms come up again. Lentils are even worse but I cannot throw away food I was given by white people. It is said that the best way to prepare lentils is mill them and mix it with maize flour to make ugali. Then you don't taste them. I also like fresh maize but I never get it. I don't work in local villages because it's all piecework. If you cannot work fast,

---

<sup>7</sup> She always managed to sell enough oil to mill the maize. Twice a week she prepared a meal with a spoonful of oil.



it'll take you several days to finish the job and then you don't have time to run your household. Working fast is difficult for me because I have a stiff shoulder since a full jerry-can of water fell on it in Rwanda. Working in HAI's garden is better for me, there I can keep my own pace."

Mrs. Mukandengo smoked daily but not much. In Rwanda she used to drink alcohol in modest quantities. "Banana beer used to be prepared once a month. Then we would drink daily (less than a bottle) until it finished and we wouldn't get it until the next preparation. I started drinking beer when I got married, but I haven't had it since the war started. Beer gives a good feeling in your body and stomach and it is good to have it when you are in the company of other people. But one shouldn't take too much as you can become rude and lose your dignity. Women can be abused by men or the baby can fall off their back."

Mrs. Mukandengo said she was surviving thanks to the food distribution in the camp. She managed to get some cash from selling oil (TSh. 200 per month) and occasional gifts from her daughter. She spent most on the mill (TSh. 200 per month), then on food from the market that she bought with money received from her daughter and lastly some on tobacco. She never bought clothes. The clothes she had were still from Rwanda or gifts from HAI.

To our question on what she found important in life, Mrs. Mukandengo answered: "To be loved and helped by your husband. Also good relations with relatives and neighbours are important. Further it is important to have children and especially the birth of the first son is a feast. Later when your children marry, you are called 'mukecuru'<sup>1</sup> which means that you are very old and important in the family. Then you also start thinking about grandchildren." As particularly sad events in her life she remembers the war that killed her family members, the death of her parents and the Rujukundi famine at the time she had her first child. "We had to eat grasses and plantain roots that taste like soil. Some priests gave food to older people but young people sometimes just pulled it out of their hands or pretended they would carry it for them and then suddenly ran away. I thought I

---

<sup>1</sup> Respectful term to be used by sons and daughters in law, however it is also used in general to address older people.

would die during that famine. I also thought that when I had dysentery here in the camp."

"My daughter is my best friend here in the camp: a child remains part of yourself. But if you compare husband and children, the husband comes first because without him you cannot have children. Another good friend is my neighbour. She gives me company, assistance and respects me as she also takes my advice for example when her children are ill. I think even younger generations respect me, they give me priority at the water tap and sometimes carry the firewood for me. Collecting firewood makes me feel sad because I remember my grandchildren who used to do it for me."

"At times when I remember my husband and children, I cannot sleep. Otherwise I sleep quite well if the rats don't disturb me. After going to church and to HAI's association, I feel good. I meet people there with whom I can talk. Also after your visit I'm happy until the next day. My worry is that I'll become old and there's nobody to help me. I'm terrified that my mind will become like that of a child and I'll beg. I hope to continue living peacefully in the camp and receiving assistance. I don't want to return to Rwanda, I'm scared to be killed. By the way, there's nobody left there, they're all dead. If they force me to go, I'll go and die."

## **6. Mr. Musirikare, 74 years**

Mr. Musirikare had just come back from the general distribution when we arrived at his blende. "I always go to the distribution point when the food is being distributed", he said. "Others collect the food and carry it to our sector where it is divided. I just go there to have some exercise and help a bit." His wife (72 years) was making porridge and also gave the neighbours a cup for their children who, from time to time, fetch firewood and water for the elderly couple. She told us that nowadays their only meals are porridge in the late morning and dinner, otherwise the peas (that were currently distributed instead of beans) do not last until the next distribution. "Before the verification we used to receive food for four persons<sup>9</sup>. Now we only get for the two of us and it's not enough. We digest the porridge quickly and then feel hungry until dinner time."

<sup>9</sup> Two children from another family were registered twice (with the elderly couple and with their own family).

The couple lived in a simple, igloo-type blende with grass walls and a plastic roof with some holes. The 'bed room' was separated from the 'living room' by a neat cane wall, plastered with mud. Behind the blende was a kitchen garden with green vegetables, sweet potato, onions and tobacco. Mr. Musirikare was quite thin and tall whereas his wife was rather chubby. Both of them used a walking stick. Their clothes were in a fairly good state and Mr. Musirikare was wearing sandals made of tires. He had a sputum producing cough.

Mr. Musirikare was born in 1922 in Kigali prefecture as the last born in the family. He never went to school. His parents used to work as labourers for a Tutsi family, his father herded cows and his mother was stable cleaner. They retired<sup>10</sup> and received a pension in the form of milk and meat when Mr. Musirikare was still relatively young. At the age of 12, when his father died (three years after his mother), Mr. Musirikare became an orphan. He felt very lonely since all his brothers and sisters had also died (one as an adult and the rest during childhood). Mr. Musirikare continued to live with the Tutsi family and they treated him as their own child. They moved to Rukara commune, which was still forest at that time, in search for grazing land for their cattle.

Mr. Musirikare decided himself when it was time for him to marry. It took the Tutsi family two years to find a wife for him in Rukara commune and come to an agreement, which made him rather impatient. "I was happy to marry because I finally became responsible for someone". He cleared a big plot of land and the Tutsi family built a house for him. The ruling king Rudaigwa (1939-1945) at that time decided that Hutus should no longer work for Tutsis but for themselves. Due to this governmental measure, Mr. Musirikare received half of the cattle flock of the family (ten cows) and the value of half a cow in cash soon after his marriage. "Then we were able to employ four permanent labourers and we became rich. We used to cultivate coffee, plantain, cassava, beans, sweet potatoes, sorghum, groundnuts, avocado, citrus, pineapple, onions, cabbage and green vegetables."

Mr. and Mrs. Musirikare became parents of ten children. Five of them died before the war and four were killed by RPF soldiers. "RPF soldiers came to Rukara and took

<sup>10</sup> In those times there was no fixed retiring age. People just retired when they became "tired".

people to prison in Gahine camp (a hospital compound with adjacent market place and houses) to kill them slowly. Many people were kept in the houses. Every now and then some of us had to search for food in nearby villages that we had to cook ourselves. The soldiers came at night and called out the names of the people to be killed. So also our youngest son. He waved to us when he left the house where we were kept prisoner. We saw that the soldiers took off his shirt and tied his hands on his back. Then he was taken away while they kicked him...

After three weeks we managed to escape at night with our daughter in law, who was already a widow, and her three children. We met people who knew how to go to Tanzania and we fled with them. We were too weak to run quickly. At our arrival in Chabalisa we were registered with our daughter in law and the three children and we received food. The next day we got a plot and plastic sheet and people who had arrived earlier made a blende for us. Fortunately we found a son later."

Mr. and Mrs. Musirikare used to live next to their daughter in law in Chabalisa I. When Chabalisa II was opened, they were not moved at the same time and now they live somewhere else in the camp. Mr. Musirikare told us: "She visits us regularly and sometimes her child stays the whole day. Our son however cannot help us very much as he has a big family of 12 to take care for. Nowadays many people in the camp improve their blende, but we're still living in an old one. I'm grateful to my daughter in law who helped me when I suffered from malnutrition about five months ago (he was in Memisa's feeding programme for two months). In Rwanda I used to drink milk and my body had a storage. But I lost the storage when I had dysentery in Chabalisa I. Moreover they stopped distributing daagaa<sup>11</sup> and as a result I became malnourished." On our question why he became malnourished and his wife not, he answered: "The blood is not the same, she is stronger. Men suffer more from hunger. Even when travelling, women can go without food but men still need beer. And if a woman dies, her husband will also die soon because he cannot prepare food, he cannot sleep alone or manage the household." Then he added: "You don't stop asking until you know everything. This is genuine research."

---

<sup>11</sup> A dried, small fish.

When we visited for the second time, Mr. Musirikare was repairing his hat with needle and thread. He told us they only have their Sunday clothes repaired by a tailor. His wife was not feeling well and laid on a mat. Mr. Musirikare said: "We haven't had porridge yet. I'll try to make it, I've got nothing to do anyhow and there's nobody else to help us." Then the neighbours brought sorghum juice and the couple drank it happily. They told us that when there isn't enough food, the wife eats less because the husband is weaker. To our question whether she also tried to get special food for him she answered: "Yes, sometimes I ask the neighbours for beans which I mix with peas<sup>12</sup>. When there is enough we both have it, when there isn't I let him have it."

Mr. and Mrs. Musirikare sold cooking oil to get money for the mill and to buy soap (approximately TSh. 200 per month). Mrs. Musirikare managed the little cash that circulated in the household. "We cannot eat the whole grain because of our teeth. Only if we run out of money, we have no choice but eating grain." Further they sometimes received plantain from their daughter in law, especially when she received her salary from HAI. Occasionally a little food came from HAI's garden where Mrs. Musirikare worked or from friendly neighbours. At the time they were receiving food for four persons, they used to sell part of it to buy preferred food. Now they only sold some oil and ate the rest. "We only eat ugali to survive. Food I really like is rice, meat and milk", according to Mr. Musirikare.

When they felt fit enough they cultivated their plot in the valley (a 15 minute walk) in the early morning before they have porridge. User rights were given to them by a Tanzanian. It was the first season they cultivated it so they had not harvested yet. They collected some loose branches on their way home and got more firewood from the neighbour's children. When they ran out of fuel, they missed a meal. In the mornings Mr. Musirikare also fetched water (he found it time consuming because of the waiting times at the tap) and chopped firewood. Occasionally he helped his wife washing clothes. He seemed to be slow in dressing himself and sometimes needed help from his wife. In the afternoons he usually visited friends while his wife was busy in the household. The couple also went to church if they felt well.

<sup>12</sup> This was eaten with ugali and green vegetables from their garden.

Mr. Musirikare rated his health as being poorer than it was in Rwanda. "Since I'm here I always feel sick. I'm becoming weaker each day due to the lack of vegetables and milk. In Rwanda I used to do heavy work, but I lost my strength since I had dysentery in the camp. I remained weak because of the poor diet. I also suffer from malaria attacks and my shoulder and joint pains disturb my sleep if not the horrible memories of what happened in Gahine camp." He found it hard to accept that he depended more on other people than in the past. For example he would have liked to construct a better blende, have better utensils and cultivate more seriously. He perceived himself as a burden for his wife as he was no longer able to earn a living, support her and provide the household with everything that is needed. "I feel like a flat bicycle tire", according to Mr. Musirikare. Nevertheless he felt respected by his neighbours as they assisted with firewood and cooked when they were ill. Younger generations, he said, were very busy achieving material wealth, rather than caring for and loving parents. He mentioned respect, wisdom and care as essential values in former times. In Rwanda, younger people spent more time listening to the elders. Moreover older people in the camp feel bored as they are less active in cultivation due to lack of land and poor health. As a result of these changes in their lives as refugees, older people may feel less respected.

His main concern was better food so that he will revive. "If it is true that we will have to repatriate soon, I doubt whether I will make it. You can compare me with an old bicycle tire that can burst anytime when it is over-used on a journey. Moreover those rumours bring back the fear of losing beloved people. I only have hope for the future if we can continue to live here in relative security and with the moral and material assistance of NGOs and the government."

#### **7. Mrs. Kantarama, 77 years**

Mrs. Kantarama was studying Kinyarwanda when we arrived at her blende. Since two months she attended HAI's literacy classes, in spite of sight problems. She lived in a well-constructed blende of mud walls, a plastic roof covered with grasses against the sun and a "proper" door of tin nailed against a wooden frame. The blende consisted of two houses under the same roof. Her son, who constructed the blende, lived next door with his wife and two children. Mrs. Kantarama was registered on the same card as her son and his family, however they ran their own households. After the distribution they

divided the food and Mrs. Kantarama cooked for herself. She got two small pots from HAI from which she also eats as she did not have plates. "When my son is around I sometimes borrow a plate from him, but when he is away his wife won't give me one."

Apart from her son, she did not have relatives nearby. Her husband and three sons died in the war and two daughters were probably still in Rwanda but she had lost hope that they survived. Her son had sent many letters to Zaire and Rwanda without any result. Unlike most refugees in Chabalisa, Mrs. Kantarama came from Ruhengeri prefecture in the north of Rwanda. Before the war she used to live with her husband and married children lived nearby. In 1990 she fled with her son to a camp in Chabingo commune for internally displaced people. This was a large settlement around the commune office which was relatively safe, due to the density of inhabitants. "The camp was managed by Caritas and we received food, firewood, utensils, clothes, blankets and plastic sheets. The distributed food was better and more than here and we also worked in villages for food and money. Since I came to Tanzania I'm no longer able to do agricultural work." Her legs were slightly swollen and the skin looked scaly. She was in Memisa's feeding centre in 1994 with oedema, abdominal pain and fullness, but the oedema recurred two months ago. "It is painful. Sometimes the pain comes up from my back and it feels like a rat that runs up and down my legs."

In 1993 the RPF threatened to attack the camp. Mrs. Kantarama and her son's family fled again and went to Rukara commune where her son bought land (he had been a businessman in Chabingo camp) and built two simple houses under one roof. A year later they had to flee again. The soldiers arrived the day after they left and set their house on fire. "In the past I was happily married with children, we never argued, we always had enough food and I was strong. Now I'm old. When I get up I feel like a car hanging over in a curve. I'm here in a camp, I have nothing, I'm not happy, all because of the war. You ask many questions that remind me of things I had forgotten."

Mrs. Kantarama was born in Ruhengeri prefecture. As she was still the only child until the age of 10, her parents decided that a second wife would be acquired. According to Mrs. Kantarama they took this decision together because they wanted a big family. The wives had a good relationship, but stayed in separate houses with their own children. The

second wife got five children who were like sisters and brothers for Mrs. Kantarama and she also took care of them.

Mrs. Kantarama's parents died soon after each other when she was married and had three children. "My parents were quite rich. When my father died of dysentery, the son of his second wife poisoned my mother to get the property. However I went to court and eventually got my share. It was a very sad case, the wife of the one who murdered my mother was paid from my bride price. This is what I received for all my gentle work in bringing them up. The murderer was put in prison for 15 years, but he was liberated by soldiers at the beginning of the war."

Mrs. Kantarama and her husband were also relatively rich and had many goats. They owned a big plot of plantain and had many labourers. They cultivated sweet and Irish potatoes, beans, peas, maize, coffee and cassava. Nowadays she felt depressed and her main daily activity was the literacy class. She slept or sat in the sun for most of the morning, drank porridge at lunch time, rested again before she went to her class at 2 p.m., then prepared dinner and went to bed. Mrs. Kantarama washed her clothes and went to church twice a month. She used to work in HAI's garden, but because of poor health the leader advised her to stop. Her son was currently in training at the Lutheran Church Training Centre for which he earned a salary. He gave some of it to his mother, bought her firewood weekly and also gave her food. However this was not enough and she also asked the neighbouring children to collect wood for her. At times the neighbours invited her for a meal or sorghum juice. "When I eat with them, I enjoy my food more. "

Mrs. Kantarama had to be encouraged and motivated frequently, otherwise she wouldn't continue talking. She showed very little interest in her environment and complained a lot. When she saw one of the home visitors passing by she accused him of being unwilling to give her a new plastic roofing sheet. He replied that her roof was still in a good state and that other elderly were much more in need, but she wouldn't listen. She also didn't see the point of continuing the interview. "You also bothered me with those tests and measurements in HAI's compound and I gain nothing from it. As an old refugee without a permanent place to stay I expect material assistance, not questions. Why do you just



ask without giving anything? I'm not sure whether I will still be alive by the time you will respond to our needs."

### **8. Mrs. Nyirandegeya, 62 years**

When we arrived at Mrs. Nyirandegeya's place she was busy in the kitchen with her granddaughter (18 years) who lived with her. After greeting us she went to the neighbour's blende to get a bench for us to sit on. In fact her neighbour was her stepson as he is her late husband's second wife's son. He lived next to Mrs. Nyirandegeya (they shared the same plot) with his wife and child. Another daughter lived in Chabalisa I with her husband and seven children. Mrs. Nyirandegeya's blende (and also her stepson's) was a poorly built shelter that got very hot as soon as the sun broke through. There were vegetables, sunflowers, tomatoes and sorghum in the small garden in front of the house. She was a rather chubby woman with a soft voice. She walked barefoot and, as typical for Rwandese women, had her head covered with a cotton cloth. She seemed quite active and eager to respond to our questions.

As a child Mrs. Nyirandegeya used to live in Rukara commune until they were forced by the Rumanura famine to migrate closer to the Tanzanian border. Many people went to neighbouring countries at that time. Her father died when they moved back to Rukara. A year later she lost her mother at the age of 10 and was cared for by her uncle. As she was older than her uncle's children, she helped to take care of them besides the house work and cultivation. She said she remembered her parents often and perceived herself as an unfortunate person. In those times education was not considered very important in the Hutu society so she never went to school.

However she did go to catechism lessons (no reading and writing skills were taught) where she fell in love with a boy who also was an orphan living with an uncle. After one year of lessons, they were baptised and a year later they married. "However we started marital life earlier", she admitted. It was painful for her husband that his family refused to pay her family a bride price. Moreover now the couple started marital life with a debt. Fortunately Mrs. Nyirandegeya's uncle was supportive of the marriage and organised a ceremony, but the groom was not escorted by anyone from his village. Mrs. Nyirandegeya's husband cleared land near his in laws and constructed a house. They had

to work very hard to pay off the debt, and so her husband also kept bees. A year after they married officially, Mrs. Nyirandegeya delivered a daughter. Fortunately the produce of a year's hard work was just enough to buy a cow to pay off the debt. It was believed that otherwise they would have had to give up their child.

Mrs. Nyirandegeya said she had a happy marriage but fortune was not hers when it came to reproduction. After a son was born, they had no more children. After waiting for about ten years, they decided that her husband would marry a second wife. A house was built for the second wife and she delivered a son, but unfortunately she ran away with the child soon and married another man. However she became ill and died a few years later. Sadly her current husband chased away the boy and the child fled to his father.

Mrs. Nyirandegeya's husband was killed in Rwanda at the beginning of the war. She managed to flee to Tanzania with her stepson and granddaughter. Fortunately she found her daughter, who now lived in Chabalisa I with her husband and seven children, and also her son but sadly he died in the camp, leaving behind his wife and six children. "I've lost hope since my beloved husband and son died. My heart is in pain, I loved them so much. I remember them even more at the times I suffer from abdominal pain and when I'm alone. I was an orphan and lived as an abandoned child until I got married. Compared to the little happiness in my life, the misfortunes were many," according to Mrs. Nyirandegeya. Her stepson's fiancée initially fled to Benaco but they found each other and lived together with their child next to Mrs. Nyirandegeya. The stepson considered her as his own mother.

Mrs. Nyirandegeya used to work in Tanzanian villages, but now her health had deteriorated due to arthritis and muscle pain in her legs and feet. "In Rwanda I could do everything without getting tired but now I have to rest frequently. In such poor health I cannot get enough food and it reminds me of past times when we sometimes had good meals. Even my daughter is not close enough to help me, she lives in Chabalisa I. I often have bad dreams about becoming an orphan again. Then I get up and just sit", said Mrs. Nyirandegeya. She also had conjunctivitis that made her tired quickly. "I probably got it from my granddaughter. When my daughter also became ill, I had to go there and nurse

her as my granddaughter was already ill. Then I also got it." She was not intending to go to Memisa's clinic as she could cure it by washing the eyes with warm water.

Sometimes Mrs. Nyirandegeya's granddaughter worked in villages for food and money. She was also involved in voluntary community work. They were constructing a building for the Anglican church where the youth can meet and pray. When she was out, Mrs. Nyirandegeya did the household chores herself. Occasionally they collected firewood together. Once a week Mrs. Nyirandegeya went to the HelpAge compound for a massage given by rehabilitation therapy workers since her legs were painful and swollen. She still worked weekly in HAI's garden in a group of older people and occasionally visited her daughter.

Mrs. Nyirandegeya's main food source was the general distribution, followed by food given by her daughter and sometimes neighbours. Then came food from villages (granddaughter's work) and the kitchen garden. Once in a while her stepson gave her a simple meal of ugali and beans. Mrs. Nyirandegeya said: "I like a meal of plantain, beans and vegetables cooked with tomatoes, but we only have that occasionally when my granddaughter has been in the village. Otherwise my appetite is poor as I'm fed up with the distributed food. I wish I had plantain, honey, groundnuts, ghee, milk and meat. I avoid going to the market because I don't want to see food that we cannot afford. At times we even run out of food all together." She also said she had diarrhoea and abdominal pain due to malnutrition<sup>13</sup>. If there is not sufficient food, she ate less in favour of her granddaughter. Any remaining cooked food was kept for the next meal or given to the neighbour's children.

Mrs. Nyirandegeya only started to drink alcohol since she had children. She and her husband started to drink more seriously when the children were teenagers. They used to have sorghum beer and banana beer with honey. She said beer is an essential drink for adults and beneficial if taken in modest amounts: "How can you have a long talk without soothing your thirst?" She could no longer afford to buy beer, but she was always given a bottle when she visited her daughter. "We used to visit friends and neighbours to relax and have a beer, but nowadays I prefer to stay at home and rest. I also visit neighbours

<sup>13</sup> Presumably she referred to malnutrition as having to live on a monotonous diet.

less often, I don't want to see good food that reminds me of Rwanda. Sometimes they visit me, especially when I'm ill. I no longer go to church because I don't have proper clothes to wear."

Although Mrs. Nyirandegeya usually kept the household money, her granddaughter made most decisions on expenditure. According to Mrs. Nyirandegeya they only spent money on the mill and to buy soap and salt. However the granddaughter also seemed to buy things for herself.

"The youth of today is not too bad. They greet me when they pass my blende, give me priority at the tap and carry my firewood home for me. The future is for young people who will return to Rwanda one day. You can talk about a future life when you have land to cultivate and the strength to work. Then you can plan. But we old people, we don't have anything, we cannot plan, we will die here. I wish and pray that people help each other and have peace. I know God is still helping me since he showed you my blende."

#### **9. Mr. Muhige, 76 years**

When we arrived at Mr. Muhige's place the curtain in the door opening was closed and we found nobody at home. Mr. Muhige's youngest son, who happened to be around, told us that his father was at the market and went to find him. Mr. Muhige appeared a little later, barefoot and walking with a stick. At first glance his igloo-type blende looked more attractive than other similar blendes because the grasses were neatly woven into the wooded frame. However many holes were visible from the inside and Mr. Muhige told us that rats and mice came through the grass walls and ate the food stock. He shared the plot with his last born who obviously had built himself a high quality rectangular shaped blende of mud bricks with a wooden door.

His wife (65 years) came home soon after. She had gone out to work in HAI's garden. In contrast to her skinny and wrinkled husband, she was rather chubby. Mr. Muhige said he only had three daughters in Chabalisa but was corrected by his wife. He admitted he had forgotten a few of them, which caused a laugh. His wife helped him every now and then during the rest of the interview and he seemed to be more motivated in her presence. The couple had five daughters (one of them is a widow, two were also registered with HAI

so they were over 50 years old) and three sons with a total number of 38 grandchildren. Two children lived in Chabalisa I with their families and the rest in Chabalisa II. Two other children and their families were killed in the genocide. He then pointed to the last born saying that he could not remember his age. We found out he was 24.

Mr. Muhige was the last born of five children in a farmer family in Rukara commune. He used to look after cows and help in the household and in farming. He mentioned that in former times Rwandese people had many cows, especially the Tutsi tribe. He was told by relatives that his parents owned 200 cows during his childhood, but when he was a teenager he realised that there were about 50 cows in the family compound. When all his brothers and sisters were married, he built a house next to that of his parents to stay nearby and help them. When he expressed his wish to marry, his parents sought a bride for him and arranged the ceremony. He said his marriage had always been harmonious, but said that he preferred the current custom that young people find their own partner. He was of the opinion that it is good to get to know each other first. In the old days the new husband and wife were strangers to each other and it could take a long time to adjust to each other. This was particularly difficult for women as men were often dominant. Consequently, if parents had not properly matched a bride and groom, the couple should not be blamed if divorce<sup>14</sup> occurred, in his opinion.

Mr. and Mrs. Muhige continued to discuss separation and divorce. "In the past, women had to obey their husband even if they were mistreated. The bride price was not refundable so it was a shame to separate without consent of the husband's parents. As a result, mistreated women had to accept their situation. Nowadays there is more freedom and a woman's dignity is not necessarily lost after a separation without the parents' consent. The young generation has more opportunities to determine their future. However not all fiancées scrutinise each other well, that's why many divorces still occur."

After the birth of the first child, Mr. Muhige went to Uganda to work. In those years many young people worked there as wage labourers. The currency in Uganda was stronger and there were more commodities available. After three months he returned to

---

<sup>14</sup> This used to be a shame for the family and reduced the chance of unmarried siblings finding a partner.

Rwanda with cash, clothes and other goods. As good times he first remembered his marriage and the birth of the first child. The marriages of the first three daughters were also important to him. His wife wept when he recalled the happy times in their life. He said he was grateful that they survived the war with nine children and arrived safely in Tanzania where they were given assistance and also had the opportunity to find food outside the camp. Two famines and the recent genocide were mentioned as particularly bad events.

The couple complained about the poor state of their blende and requested HAI's assistance. They were informed that HAI was trying to mobilise able-bodied older people to construct mud brick blendes for vulnerable elderly. On our suggestion that their last born could probably help, Mr. Muhige said: "We cannot force him. Moreover he remains our child and we don't want to argue with him. The other children have their own problems and are only able to help us with little things. They also have to take care for their own families."

Most household work like fetching water and firewood, washing clothes, cooking and sweeping was done by Mrs. Muhige, sometimes helped by the youngest son if he felt like. Sometimes Mr. Muhige helped his wife collecting water or did other light tasks when she was not around. Occasionally he collected some loose branches of firewood in a nearby valley, although he felt sick afterwards. He said: "We have to go ourselves, the neighbours can only give us wood occasionally and their children do not help." Otherwise he did not do much and usually spent some time at the market or visited friends before lunch. In Rwanda the couple used to live with their son and granddaughter. The son used to collect firewood that was available nearby and the granddaughter did the house work. However several months ago she decided to go back to her mother who is Mr. and Mrs. Muhige's first child. She could not send another child as she only had two. To our question if that granddaughter provided help we were told that she also did not behave very well. She was still on their ration card and came to collect her share after every distribution. The day before our last visit, Mr. and Mrs. Muhige were sent a seven year old granddaughter to stay with them. They commented: "She is new in school and actually too young to be of serious assistance. If offered, we would accept another grandchild, but we don't ask for it."

The first year in the camp Mr. Muhige was still stronger than his wife, able to work in the village and even fetch construction wood. Then they could afford a varied diet. He said his health deteriorated since the beginning of 1995 but got really bad after he was seriously ill for a month from malaria and abdominal pain. Since then he had not regained weight. Now he was unable to do strenuous work, found it increasingly difficult to visit his children in Chabalisa I, and even going to church had become a problem. He often had malaria, worms, back pain and moderate diarrhoea or vomiting. He ascribed his poor health to the inferior and monotonous diet. He went several times to the clinic and was given medicines and supplementary food that he shared with his wife and son. Although it brought some relief, his health continued to worsen and he no longer received the food. Mrs. Muhige was also not very fit. She had a painful, swollen knee, chest pain and frequent headaches and sleeping problems. She went several times to HAI's rehabilitation centre and was given a walking aid. However she only used it if the pain persisted. She said: "We are nothing now, we'll die here together. I go to HAI's garden to meet people and forget the problems otherwise I get bad dreams. My husband goes to the market." Mr. Muhige added: "We feel better now because you talk to us, but when you leave we'll be alone again."

Although the youngest son lived in his own blende, he still ate with his parents. Besides the general ration they got food from their garden, married children and HAI's garden where Mrs. Muhige worked. The youngest son did not seem to bring in a substantial amount, although he sometimes worked in villages. He ate a larger quantity than his parents, but if the food was not sufficient, all of them ate less. Mr. Muhige noticed a change in taste as he got older. He no longer likes plantain, sweet potatoes and banana beer. He started drinking beer as a child as it was believed that beer cured abdominal pain. He no longer tolerates beer since he became frequently ill.

Mr. and Mrs. Muhige received money from married children and used it to pay (in descending order) for the mill (TSh. 200 per fortnight), to buy beans, salt, onions, tomatoes, sorghum juice and matches to light the fire. Mrs. Muhige usually kept the money but consulted her husband on expenditures. Their money was insufficient to buy clothes, and they had bought none since Mr. Muhige stopped working in villages. We learnt that another son lived very close by and sometimes gave money for the mill. He

had said: "Don't ask for my help if my younger brother is around. But if he is in the village, I'll help you fetching water and wood." Apparently another grandchild had also stayed with them before the current one came, but she also refused to assist as soon as the son came home.

Nevertheless Mr. Muhige said to be quite satisfied with his involvement in the family despite his weakness. "My children come for advice and even the last born sometimes respects my instructions. At times even unrelated persons ask our advice in disputes, which means that we are respected." Regarding younger generations he said: "Their attitude is not too bad, they greet us when they pass." How about your youngest son? "Older people also have to behave well. Although he could assist more, we thank him when he gives a small amount and we shouldn't complain too much about him." What is the difference between the youth of today and when you were young? "When we were young there were tasks for boys and girls. Boys fetched water and wood and girls did the housework. Nowadays they dress up, go out without saying where to, come home late and ask for food without having helped in the household. This is not a positive development but we have to accept it. If I were in Rwanda, I would tell young people to work hard for a prosperous future. Here they first think of themselves even if they see us suffer. "

A final comment of the couple: "We are always ill, we are waiting to die. Only God knows when that will happen. When our day is there, he will come and take us. "

#### **10. Mr. Kajeguhakwa, 93 years**

Mr. Kajeguhakwa lived with his wife in a tiny, shabby blende on the edge of the camp. The plastic roof, tightened by ropes, was worn out. The place looked untidy and was scattered with bean leaves, grasses and little branches and sticks. Although Mr. Kajeguhakwa obviously was a very old man, he did not seem as old as 93. He was still quite fleshy and had muscular legs, but he used a stick to walk and get up. He was a very quiet man and much less enthusiastic about our visit than most other elderly. His wife (46 years) was stocky and had a swollen leg from mild elephantiasis and a skin rash.



Mr. Kajeguhakwa said he used to cultivate in a group of men for a couple of hours per day before the war. Now one of his main activities was collecting fuel. He tried to find leaves and grasses in the surrounding and went to a nearby valley to look for loose branches. Further he walked around to visit friends in the afternoon, listen to the news at the neighbours' who had a radio and rested after meals. When his wife was not around he also collected water and sometimes went to church. Neither of them was able to generate an income so they mainly depended on the general ration and their little garden for food. Mr. Kajeguhakwa went to HAI whenever goods were distributed. They got some cash for the mill by selling oil from the general ration. He said he thanked God that they were still surviving on ugali, although it is not sufficient and not nice food. "Something is better than nothing." They reheated any remaining cooked food for the next meal and if he could not finish his plate, his wife finished it.

Mr. Kajeguhakwa was born in Rukara commune and used to help his parents with household chores. At the age of about 12 he was sent to live with a Tutsi family where he stayed until he married. He looked after 8-10 cows in exchange for milk for his family. He said they were like parents for him. They also had their own children who went to school. He played with them as if they were his own brothers and sisters. To our question whether he had wanted to go to school he answered: "How could I? I was there to work." He did not mind staying with them, after all he got milk which he did not get at home. However he was always happy to go home for a couple of days occasionally.

When it was time to get married, his mother was already widowed and therefore his uncle arranged a partner for him. He said he was lucky his uncle and mother selected a good wife for him. He constructed a house on his mother's land so that he could care for her and cultivate her land. Later he cleared forest to have his own land and grew coffee, plantain, beans and sweet potatoes. When he had five children, he received three cows from the Tutsi family as the king had decided that Hutus should no longer work for Tutsis. The couple had six children in total. When the last born was about 8 years old, he decided to take a second wife as "the first one was old and I could afford it".

His second wife was separated and had already one child. Mr. Kajeguhakwa built a house for her and divided his land between the two wives. Their relationship was good

according to him. His second wife's child was currently in Rwanda, if still alive. His first wife and children all died in the war. Mr. Kajeguhakwa said the only relatives nearby were a brother with his wife and four children. "They are also old, always sick and weak, so they cannot help us. We are surviving thanks to our neighbours. They give us moral and material support. They give us firewood and sometimes food and they even ask my advice in case of problems."

According to Mr. Kajeguhakwa he was given sorghum beer with honey from his father's beehives since he was a baby and started drinking banana beer around the age of 17. He believed that beer cleansed the blood. Further it is a sign of close friendship, and thus part of the bride price, and also offered to "brothers". However people can become like "animals" if they take it in excess.

Considering the youth he said that there was more social control in former times and even social repercussions to a person or family who did not assist and respect older people. He reckoned that a person's upbringing and character determine much of his/her behaviour. Some people are just kind to others without being taught and the contrary also occurs. Moreover expectations of respect for the elderly may differ. Urban elderly with educated children often do not expect much from them and are satisfied with a good relationship, whereas rural elderly tend to cherish traditional values.

As particularly good times Mr. Kajeguhakwa remembered the marriages of his children and the period that president Habyarimana ruled. "At that time there was peace, we worked for ourselves and had good food and beer." As bad times he mentioned the time that Hutus worked for Tutsis, "some Tutsis were bad and beat Hutus." And naturally the war in which many people were killed and the current life of poverty in the camp.

Mr. Kajeguhakwa expressed concern about his deteriorating health and the well-being of his wife after his death. "We have absolutely nothing, just a poor diet and shelter and two sets of clothes that we brought from Rwanda. I cannot sleep if I think about her after I'll have passed away. All I can do is pray for continued assistance of neighbouring friends and foreign organisations, but I see the future as very bleak particularly because of rumours of repatriation."

During the interview we hardly got eye contact with Mr. Kajeguhakwa. Although he did not seem depressed, he was staring down most of the time and only smiled sparingly. Although he was co-operative, his answers were short and straightforward - almost without emotion - and he was not very talkative. Unlike some other respondents, Mr. Kajeguhakwa did not suggest he expected material assistance from us.

### **11. Mrs. Barakagira, 81 years**

When we arrived at Mrs. Barakagira's blende, she was sitting outside on a small bench, washing her clothes. She looked physically strong, fat rather than skinny, and one would not have thought she was 81 years<sup>15</sup>. Her pregnant daughter in law was peeling beans. Apparently they had a good harvest, the whole compound was covered. Mrs. Barakagira lived at the edge of the camp, where it was relatively spacious and quiet. She shared a plot with her son and his family. Two pretty blendes were constructed opposite each other so that a sort of compound was formed between them. The blendes were almost proper mud houses, each with two bed rooms and a sitting room. There was a kitchen on the compound, a chicken cage behind one of the blendes and a latrine in the garden. Various crops were cultivated in the garden such as sorghum, sunflowers and vegetables.

Mrs. Barakagira lived in one blende and her son (48 years) and his wife (30 years) in the other. This was his second wife whom he married in the camp and they were expecting their first child. He had six children aged 7 to 20 years from his previous marriage and also took care of a 5 years old orphan. He was employed in the camp as a social worker with Save the Children and was obviously a respected person in his neighbourhood. The children were divided between the two blendes and all of them except the youngest went to school. They seemed to run a common household. Although they cooked separately, the whole family ate at the same time. Mrs. Barakagira cooked with some of the children and her son and his wife with the other children. She felt there was enough food for the family, however she did not get all the foods needed to stay healthy such as plantain, meat, and milk<sup>16</sup>. With so many children and just one bread earner they could not afford to buy these foods. Sometimes her son bought her plantain which was then shared with the children. Now her daughter in law was pregnant, her needs had also increased.

<sup>15</sup> However asking her about local events as well as consulting her son, led to the conclusion that she was at least 81 years old.

<sup>16</sup> Later we saw two sacks of beans being carried into her blende.

Although she preferred a meal of plantain, meat and vegetables, she seemed to have less problems than other refugees eating maize grain and ugali, as this was also common food in Ruhengeri prefecture where she was born.

Mrs. Barakagira was pleasant to talk to. She told us she saw a role for herself in bringing up her grandchildren. She taught them how to prepare food and do other household tasks. They responded well to her and seemed to respect her as a mother. The oldest grandchildren usually fetched firewood for the family. After lunch Mrs. Barakagira always slept for a while. She kept one day per week to go to church and pray the entire day, one day to visit friends from her neighbourhood in Rwanda who lived in Chabalisa I and one day to work in the garden. In Rwanda she used to make mats and baskets, but due to the lack of raw materials in the camp and her poor eyesight, she had stopped. She took a bath three times a week.

Mrs. Barakagira's father died when she was about 5 years old. Her mother decided not to remarry but brought up the three children herself. As the eldest child, Mrs. Barakagira helped her mother often and started with cultivation and heavy household tasks earlier than other children of her age. As her mother could not manage without her assistance, she did not go to the missionary school. One day, Mrs. Barakagira's uncle came to visit them together with a boy who lived in the same village. The boy came back several times and they became friends. Their parents agreed when they told them they wanted to get married. Mrs. Barakagira's uncle acted as her father in negotiations between the families about the bride price. The boy's family paid a cow and five goats and according to the custom Mrs. Barakagira's uncle gave her utensils and the like to take with her into her marital life. The couple would be blessed with ten children.

Originally Mrs. Barakagira and her husband were animists. However missionaries introduced them to Christianity and they were baptised by the time they had two children. When the family had expanded to seven members, they migrated to Kibungo where more land was available. They only used to cultivate food crops as labourers were needed for cash crops (coffee) which they could not afford. Mrs. Barakagira told us she was happy with the introduction of Christianity. "It provided spiritual freedom, now at least we had the choice to continue with traditional beliefs or convert to Christianity.

Christianity taught people to live a peaceful and productive life and respect each other. It also advocated more freedom for women in society who, until that time, just had to obey men even in very personal matters. Most children wanted to attend missionary schools, but unfortunately many parents were reluctant. They accused their children of wanting to avoid household work and pursue jobs with European agencies."

Unfortunately seven children had died - some very young - from malaria and other illnesses. Mrs. Barakagira also became sad when she remembered the genocide of 1994 that cost so many lives. Her husband and daughter in law were killed at Kamarashavu, where soldiers had called a meeting under false pretences. Only very few managed to escape.

Mrs. Barakagira told us that her health was poor at the time she fled from Rwanda. Fortunately it improved considerably, but was still not as good as before she fled. She could no longer do the heavy work she used to do. But despite becoming older and weaker, she wanted to remain active in the household and with the grandchildren and rated her health better than that of other people of her age. She ascribed this to not smoking or drinking beer. "My parents already gave me beer as a baby since it was believed it would treat abdominal infections. When I was older I just used to drink beer because everyone did so and it gave prestige. However later I realised that beer and smoking spoil the body and people become addicted and I stopped drinking when I became a Christian."

It was hard to get Mrs. Barakagira talking about income generating activities of her grandchildren and daughter in law. She said she took interest in their activities at home rather than outside. She admitted she always saw her daughter in law leaving in the morning, but she did not seem to know where she was going. Her son kept the household money and decided on finances. Nevertheless she tried to rank the household's expenditure (in descending order): purchase of beans, sweet potatoes and salt, clothes, milling maize grain, purchase of firewood, church, household utensils.

Mrs. Barakagira said her son was the family head, but all family members respected her because of her age and vast experience. She said she loved them all equally. Concerning

the attitude of the youth she said she noticed a change of norms and values. "Young people of today are free to do whatever they want without feeling shy. But they do offend older people. For example the friendship of a boy and a girl before marriage and embracing in public. They may even live together as partners without the consent of their parents. But many younger people also show respect for the elderly by bowing when they greet, standing up for them in church and giving other assistance. A few show deviant behaviour, but that must be due to poor care from the parents or sometimes total lack of care like with unaccompanied children."

Although she realised that she was better off than most elderly in the camp and she appreciated that she was living in a good house with relative security, she was not satisfied with her present situation. "If I would only get proper food such as plantain, rice, milk and sugar four days a week, I would be able to do heavy work like gardening and fetching water." The future did not worry her much since so far she had received all possible support from her son and his family. However she was alarmed by recent rumours about repatriation.

## **12. Mr. Bihire, 80 years**

Mr. Bihire lived with his wife (78 years) and two granddaughters (7 and 5 years old). Three sons and four daughters also lived in this camp with their families (in total 32 grandchildren). Another son was in a Tanzanian prison<sup>17</sup>, but his wife and children were in the camp. The third born son lived nearby but had malaria. He and his wife were very kind to Mr. Bihire. Mr. Bihire told us that he was not well either. He said he became seriously ill with fever, cough, joint pain, back and chest pain and was tested positive for malaria. We noticed that he was trembling to such an extent that he had difficulties getting up and keeping his balance. He seemed to be chatty and had humour, although his health status prevented him from talking at length.

Mr. Bihire was born in Byumba prefecture. He assisted his parents in the household, but also made some tools and gathered honey in the forest. He entertained his friends by playing a traditional instrument and dancing. When he was about 12 years old, his father

---

<sup>17</sup> He was arrested while he was looking for work in local villages.

died due to hunger in the Rwakahiura famine (1916-1918)<sup>18</sup>. His mother decided to move to Ruhengeri with her three sons and few belongings. They took three cows with them and had to leave the other animals behind. After a while his mother died of dysentery and his elder brother decided to return to Byumba to check their farm and flock. Sadly his other brother also died soon afterwards and Mr. Bihire remained alone, praying for something good to happen. Luckily he met a childless widow who was prepared to be his surrogate mother and he stayed with her until he married.

Shortly after he got married his brother turned up again. He had found their former farm occupied and had gone to Rukara instead. From that time on he visited Mr. Bihire regularly. When they had seven children, Mr. and Mrs. Bihire needed more land. Therefore they joined Mr. Bihire's brother in Rukara, cleared a piece of forest and cultivated a wide variety of crops. They had received some cash from the communal leader in Ruhengeri as a farewell present. In Rukara they started with two cows they received when the first daughter married. The animals had bred to a flock of about 18 cows. Most cows were given to the sons as assets for their future. When the war broke out the remaining animals disappeared in the commotion, but they managed to flee with two cows. Upon arrival at the Tanzanian border they were forced to sell them for TSh. 3,000. Just after they had passed the border, the soldiers arrived and killed many people.

In contrast to their son's good blende with mud walls (he worked for Oxfam), Mr. and Mrs. Bihire's blende was in poor state. Mr. Bihire could hardly get through the low door opening. Sometimes he fell and needed his wife's help to get up again. His wife also seemed to be weak and ill however she was in a better state than him. Mr. Bihire told us that the two granddaughters who stayed with him were orphans of his beloved son. The son had died of an unknown disease, apparently because his wife bewitched him (it became known after his death that she had come from a "witch clan" in Byumba). Therefore his brothers intended to murder her and she fled. This event was very painful for Mr. Bihire, but he was happy that the children remained unhurt.

<sup>18</sup> Although his son confirmed that he was 80 years and two years older than his wife, the statement regarding the famine could indicate that they may have been 90 and 88.

Mr. Bihire normally got up late and passed his day sitting at home or at his third son's blende. If he did not feel well he only ate porridge, otherwise he ate a little ugali and beans. He complained that he asked his eldest son, who also worked for Oxfam (as a watchman), to build him a better blende, but nothing had happened yet. He never visited them, however his wife did come. Only the son who lived nearby assisted them, the other sons just visited without giving anything, even not for his two granddaughters. It was said that the sons were of the opinion that he diminished his wealth too much by paying bride prices for big wedding ceremonies. Hence it was his own fault that he entered the war poorer than he could have been, so they did not feel obliged to help him.

Mrs. Bihire collected firewood if she felt strong enough. She went early in the morning in a group with other people and returned at about 2 p.m. The daughter in law who lived nearby also assisted in the household and sometimes his daughter's children came to help. Most of their food came from the general distribution. Every now and then they also got food that his third son had earned and some daughters also brought food. They had a small kitchen garden where they grew beans.

At the second visit Mr. Bihire was in a deep sleep and was woken up by his daughter in law. His situation had worsened and it was hard to talk with him so we did not continue the interview. Sadly at the third visit he had deteriorated again. His wife was also ill since a week and the two grandchildren were not well either. According to the daughter in law this was a bad sign, that a family member may die soon followed by a second one.



**Annex 6.2 Group characteristics at various levels of well-being defined by men and women<sup>†</sup>**

MEN	WOMEN
Characteristics of the very poor	Characteristics of the poor
Unable to work due to old age or disability	Unable to work due to old age or disability
No income generating capacity	No income generating capacity
No relatives or others to provide assistance	No relatives or others to provide assistance
No working tools or household utensils	No working tools or household utensils
Characteristics of the poor	
Unable to work due to old age or disability	
No income generating capacity	
Some assistance from relatives or others	
Characteristics of the well-off	
Physically able to work	Physically able to work
Income from daily labour	Have husband and children
Possess tools and utensils	Possess tools and utensils
Have a family	
Characteristics of the best-off	
Physically able to work	Physically able to work
Income from permanent occupation or income generating activity	Have husband and children who support parents
Possess tools and utensils	Possess tools and utensils
Able to care well for family	Assistance from relatives or others
Eating good food	Eating good food
Independent from general distribution	

<sup>†</sup> Men distinguished four levels and women three

## Annex 6.3 Prevalences of demographic characteristics by age groups

Demographic characteristics	% <60 yrs	% 60-69 yrs	% ≥70 yrs	Total %	$\chi^2$ age
Marital status					
				n=826	
Married	69.4	51.9	48.9	59.4	31.8**
Widowed	26.6	40.6	46.6	35.2	
Divorced/separated	4.0	7.4	4.4	5.3	
Educational status					
				n=825	
Illiterate	63.9	74.8	83.8	71.3	25.3**†
Informal education	8.7	8.4	5.9	8.1	
Standard 1-6/ higher formal	27.4	16.8	10.3	19.3	
Occupation in Rwanda					
				n=825	
Landless/ farmer with land	66.8	56.1	66.2	62.7	9.1*‡
Farmer (land and cattle)/ civil service/private	33.2	43.9	33.8	37.3	
Current economic status					
				n=820	
Can afford to offer drink	49.5	33.0	16.9	37.9	50.1**

Significance levels: \*\*p&lt;.001, \*p&lt;.05

† The categories 'higher formal education' and 'standard 1-6' were collapsed for this analysis.

‡ The categories 'farmer with land and cattle' and 'civil service/private' were collapsed for this analysis as well as 'farmer with land' and 'landless farmer'.

## Annex 6.4 Prevalences of living arrangements and care by age groups

	% <60 yrs	% 60-69 yrs	% ≥70 yrs	Total %	$\chi^2$ age
Living arrangement	n=826				
Alone	1.1	2.6	4.4	2.2	-
Without younger adults†	2.4	3.5	10.2	4.1	16.1*
Spouse	68.1	51.0	48.9	58.5	26.7*
Child(ren)	93.4	81.9	67.9	84.9	54.3*
Grandchild(ren)	21.1	42.9	59.9	35.7	77.0*
Other relatives	7.1	6.1	8.0	6.9	0.6
Unrelated persons	6.1	4.5	2.2	4.8	3.4
Receiving care from	n=826				
Spouse	68.1	49.4	45.3	57.3	34.1*
Son‡	71.5	58.1	45.3	62.1	32.9*
Daughter‡	73.6	60.6	43.8	63.8	40.9*
Grandchild(ren)	6.1	22.9	33.6	16.9	66.6*
Other relative	7.9	6.8	9.5	7.7	1.0
Friend/neighbour	39.8	43.2	37.2	40.7	1.6
NGO/others	2.4	2.5	0.7	2.1	-
Nobody	0.0	0.6	2.2	0.6	-

Significance level: \* $p < .001$ 

† Alone or only with spouse

‡ Including in-laws

## Annex 6.5 Prevalences of material and financial support by age groups

Support	% <60 yrs	% 60-69 yrs	% ≥70 yrs	Total %	n	$\chi^2$ age
Food received <sup>‡</sup>	19.1	22.1	27.0	21.5	822	3.8
- used for househ. cons.	94.4	92.5	97.1	94.3	174	-
- received from children	57.5	60.3	51.4	57.3	178	0.8
- received from friends or neighbours	41.1	36.8	35.1	38.2	178	0.5
Money received <sup>‡</sup>	13.5	18.7	23.4	17.1	826	7.9*
- used for househ. cons.	90.2	80.0	96.8	87.6	137	-
- received from children	70.6	64.9	50.0	63.6	140	3.7
- received from friends or neighbours	25.5	21.4	31.3	25.2	139	1.0

Significance level: \* $p < .05$ <sup>†</sup> Headings preceded by a hyphen are a breakdown of the preceding main heading and their percentages refer to that particular sub-sample.<sup>‡</sup> Received as a gift from outside the household. The frequency varied from occasionally to daily.

**Annex 6.6 Prevalences of respect and emotional support by age groups**

Respect	% <60 yrs	% 60-69 yrs	% ≥70 yrs	Total %	n	$\chi^2$ age
Consulted	91.3	92.3	84.6	90.5	825	7.0*
Never pays for assistance	89.2	96.1	97.1	93.1	826	-
Emotional support						
Has people to talk to	98.7	99.0	97.8	98.7	826	-
Shares feelings	89.2	96.1	97.1	93.8	823	1.1

Significance level: \*p&lt;.05

**Annex 6.7 Prevalences of involvement in activities by age groups**

Activities	% <60 yrs	% 60-69 yrs	% ≥70 yrs	Total %	$\chi^2$ age
Gardening	80.5	72.6	46.7	71.9	56.9**
Heavy household tasks	44.9	43.2	30.7	41.9	8.7*
Light household tasks	67.5	75.5	70.1	70.9	5.3
Child care	9.2	5.8	5.8	7.4	3.5
Paid labour†	41.7	21.3	11.7	29.1	58.5**
Unable to do any activity	0.8	2.3	6.6	2.3	-

Significance levels: \*\*p&lt;.001, \*p&lt;.05

† Probably underreported as this is officially illegal for refugees.

### Annex 6.8 The health situation among the refugee population in Karagwe.

Between April and the beginning of October 1994 the Rwandan refugee population in Tanzania (mainly in Ngara and Karagwe districts) had risen to an estimated 550,000. Although people seemed to arrive in relatively good nutritional and health status, camp conditions were deteriorating rapidly as facilities were overwhelmed. Mortality rates of 10/10,000/day occurred which is comparable to a famine or major catastrophe (>5/10000/day), although the prevalence of wasting was around 10% which is not excessive (Hakewill, 1991; UN ACC/SCN, 1994). Medical staff in Karagwe district reported there were also malnourished and exhausted adults and elderly. In 1994 the mortality rate in Chabalisa was also 10/10,000/day. It took until December 1994 to recover and stabilise. At that time the first child nutrition survey was carried out and gave a figure of 9.2% <80% W/H. It was around this time that people got settled and started activities in and around the camp.

Nutrition surveys for children under five were carried out in April and October (the end of the wet and dry season respectively) as these were the periods when malnutrition rates were expected to be highest. In 1996 the average birth weight in Chabalisa II was 3-3.5 kg.

#### Undernutrition in children under five in Chabalisa II

	12-'94	27-4-'95	19-10-'95 <sup>†</sup>	28-11-'95	18-4-'96
<80% W/H	9.2%	2.8%	9.4%	1.1%	2.2%
<70% W/H or oedema	-	1.1%	3.1%	0.6%	0.3%

<sup>†</sup> October 1995 survey results were questioned.

#### Undernutrition in children under five in all camps in Ngara

	9-'95	3-'96
<80% W/H	4.1%	3.6%
<70% W/H or oedema	-	1.6%

In the local Tanzanian population 10-16% undernutrition was reported in children under five. However these are data from the local hospital and mother and child health and vaccination clinic and cannot be considered to be reliable as children usually only present at the hospital or clinic when they are ill.

Undernutrition in Rwandan children in the period 1984-1995 was 4% <80% W/H and 48% <80% H/A, which was similar to Tanzania's national figures (World Bank, 1997). Under five mortality in Rwanda in 1995 was 200 per thousand which was not even 10% higher than before the war in 1991. However maternal mortality was 1,512 per 100,000 live births, which was more than double the figure of 1991 (World Bank, 1997).

The most common health problems in the refugee population older than five years:

1. Malaria was the most prevalent disease throughout the year: 80-90% of clinic attendants (all ages) have malaria (related) problems. Blood was only checked if the patient did not respond to chloroquine treatment.
2. Respiratory infections (pneumonia, asthma, bronchitis etc.) were the second main health problem. Prevalence fluctuated due to weather conditions (humidity in cold, rainy season and dusty in hot, dry season).
3. Skin diseases (scabies, eczema, staphylococci etc.).
4. Diarrhoea. This was more prevalent when there was water or firewood shortage (end of October and April), when people used to cook for several days at once. Normally diarrhoea rates were low.

The mortality rate in the population over five years of age was usually lower than 0.5/10,000/day, which is normal in developing countries.



## Annex 6.9 Prevalences of clinical signs and symptoms by age groups

Signs and symptoms	% <60 yrs	% 60-69 yrs	% ≥70 yrs	Total %	$\chi^2$ by age	$\chi^2$ men by age	$\chi^2$ women by age
Poor health (self report)	7.3	11.6	29.4	12.6	44.8***	18.1***	27.8***
Men	5.3	9.2	22.9				
Women	9.4	14.0	36.4				
High blood pressure <sup>†</sup>	15.2	19.4	27.7	18.8	10.4**	7.7*	4.2
Men	9.5	15.0	22.5				
Women	20.8	23.6	33.3				
Loss of senses							
Poor sight	10.0	25.5	53.3	22.9	108***	-	-
Poor hearing	0.0	0.2	0.4	0.6	-	-	-
Redness conjunctiva	6.8	15.5	19.0	12.1	19.4***	-	-
Excessive eye pus	3.4	5.2	8.1	4.8	4.9	-	-
Whiteness lens	1.8	3.6	10.9	4.0	22.1***	-	-
Dentition							
Missing teeth	41.7	49.4	66.4	48.7	24.7***	7.0*	22.2***
Men	40.2	41.2	57.7				
Women	43.2	57.3	75.8				
Chewing problems	39.4	47.7	65.7	46.9	28.2***	5.8	27.1***
Men	38.6	45.8	54.9				
Women	40.1	49.7	77.3				
Food not eaten <sup>‡</sup>	22.3	35.2	53.3	32.2	46.2***	5.5	53.9***
Men	25.9	29.4	40.8				
Women	18.8	40.8	66.7				
Gastro-intestinal disorders							
Watery stool > 1 wk	1.3	1.0	1.5	1.2	-	-	-
Defecation pain > 1 wk	13.4	11.3	13.9	12.7	0.9	-	-
Nausea	13.1	11.6	14.6	12.8	0.8	-	-
Vomiting	4.5	4.2	8.0	5.0	3.3	-	7.0*
Men	4.8	1.3	2.8				
Women	4.2	7.0	13.6				

Vitamin/mineral deficiencies							
Pale conjunctiva	2.6	1.9	1.5	2.2	-	-	-
Sore gums	7.6	8.4	11.0	8.5	1.5	-	-
Bleeding gums (spont.)	0.8	0.6	4.4	1.3	-	-	-
Wound healing > 2 wk	3.7	4.2	3.6	3.9	0.1	-	-
Respiratory infections							
Cough > 1 wk	19.2	23.2	26.3	21.9	3.5	-	-
Bloody sputum	1.3	0.6	0.7	1.0	-	-	-
Dyspnea	2.4	4.5	4.4	3.5	2.7	-	-
Fever							
Sweating/shivering	16.0	18.1	19.7	17.4	1.1	2.5	7.0*
Men	16.9	11.1	12.7				
Women	15.1	24.8	27.3				
- for > 1 wk° (n=143)	67.2	76.8	61.5	69.9	2.3	-	-
Functional ability							
Arthritis	2.6	10.7	17.5	8.1	34.3***	-	23.2***
Men	1.6	5.2	12.7				
Women	3.6	16.0	22.7				
Depression symptoms							
Frequent in last year	22.6	22.3	19.7	22.0	0.5	-	-
Exposure to							
Alcohol	69.3	63.2	56.2	64.9	8.1*	2.9	6.8*
Men	81.5	77.8	71.8				
Women	57.3	49.0	39.4				
Smoking	61.4	59.4	56.2	59.8	1.8	-	-

Significance levels: \*\*\*p<.001, \*\*p<.01, \*p<.05

† Defined as >140/90 mm Hg

‡ Mainly maize grain and meat that were not eaten because of dentition.

° Sub-sample of the preceding main heading and percentages refer to the sub-sample.

## Annex 6.10 Prevalences of food preparation by age groups

Food preparation by	% <60 yrs	% 60-69 yrs	% ≥70 yrs	Total %	$\chi^2$ age
Self	52.2	56.8	51.8	53.9	1.7
Spouse	47.2	40.3	43.1	43.9	3.6
Daughter <sup>†</sup>	70.2	54.5	41.6	59.6	39.4**
Son <sup>†</sup>	24.3	15.5	12.4	19.0	13.2**
Grandchild	3.7	17.4	26.3	12.6	57.1**
Other relatives	1.8	2.3	1.5	1.9	-
Friends or neighbours	0.3	0.3	2.2	0.6	-
Subject receives help	91.3	84.5	83.9	87.6	9.3*

Significance levels: \*\*p&lt;.001, \*p&lt;.01

<sup>†</sup> Including in-laws.

**Annex 7.1 MUAC-BMI regression equation and sensitivity and specificity data**

Whole group		r	R <sup>2</sup>	SE	n
MUAC (cm) =	8.61 + 0.82 BMI	0.84	0.71	1.34	822

	BMI $\geq 18.5$ kg/m <sup>2</sup>	BMI < 18.5 kg/m <sup>2</sup>	Total
MUAC $\geq 23.7$ cm	615	39	654
MUAC < 23.7 cm	73	95	168
Total	688	134	822

	BMI $\geq 17$ kg/m <sup>2</sup>	BMI < 17 kg/m <sup>2</sup>	Total
MUAC $\geq 22.5$ cm	748	13	761
MUAC < 22.5 cm	41	20	61
Total	789	33	822

	BMI $\geq 16$ kg/m <sup>2</sup>	BMI < 16 kg/m <sup>2</sup>	Total
MUAC $\geq 21.7$ cm	798	1	799
MUAC < 21.7 cm	17	6	23
Total	815	7	822

### Annex 7.2 Associations between poor test performance and low BMI

Impaired in	Sex	% BMI $\geq$ 18.5	% BMI<18.5	$\chi^2$
Handgrip	all	19.7	29.9	6.9**
	m	21.5	38.8	10.3***
	f	18.1	16.7	0.1
Chair rises	all	27.7	33.6	1.9
	m	28.1	27.5	0.0
	f	27.3	42.6	5.3*
Lock & key	all	27.6	18.7	4.7*
	m	28.1	17.5	3.8
	f	27.2	20.4	1.1
Plate tapping	all	30.0	21.6	3.9*
	m	29.6	21.3	2.2
	f	30.4	22.2	1.5

Significance levels: \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$

### Annex 7.3 Regression results for nutritional vulnerability

The tables in annex 7.3A-E provide adjusted regression coefficients ( $\beta$ ) to allow direct comparison between the variables. Variables that never reached significance are not included in the table and a variable name with no  $\beta$  coefficient means that this (group of) variable(s) was controlled for, but did not appear in the final equation.

#### Annex 7.3A Regression results for nutritional vulnerability with BMI as dependent variable

BMI	MEN		WOMEN	
	$\beta$	$\Delta R^2$ (%)	$\beta$	$\Delta R^2$ (%)
handgrip strength	.257***	6.8	.117*	2.6
smoking	-.229***	4.2		
plate tapping	.182***	2.3		
blood pressure	.117*	1.6	.141**	1.8
bleeding gums	-.127**	1.4		
paid labour	-.114*	1.2		
kitchen garden	.099*	0.9		
light hh act	.099*	0.9		
cons non cereal staple			.170***	1.6
1 meal per day			-.144**	2.1
offer drink to guests			-.147**	1.2
receive food as gift			.114*	1.1
arthritis			.105*	1.1
<i>Controlled for:</i>	age		age	
	food intake variables†		food intake variables†	
	social support variables‡		social support variables‡	
	poor health		dressing	
	literacy		lock&key test	
	kyphosis		kyphosis	
			poor health	
			memory probl	
constant B	16.68***		17.22***	
multiple R	.439		.339	
R <sup>2</sup> (%)	19.3		11.5	
adjusted R <sup>2</sup> (%)	17.6		9.7	
SE	1.68		2.0	
F	11.62***		6.38***	
df	397		351	

Significance levels: \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$

† Food intake variables were: consumption of cooking oil, green vegetables, non cereal staples, 1 meal per day, eating enough, food diversity score, preparing food self.

‡ Social support variables were: being consulted by relatives and friends, sharing feelings, having people around to talk.

**Annex 7.3B Regression results for nutritional vulnerability with arm muscle area (AMA) as dependent variable**

AMA	MEN		WOMEN	
	$\beta$	$\Delta R^2$ (%)	$\beta$	$\Delta R^2$ (%)
handgrip strength	.39***	16.7	.297***	5.9
smoking	-.133**	1.8	-.106*	1.1
chair stands	.178***	1.5	.192***	2.4
blood pressure	.119**	1.6		
receive money as gift	.121**	1.3		
word recall test	-.114*	1.0		
mobility	-.108*	0.9		
constipation	.095*	0.8		
literacy	-.087*	0.8		
poor health			-.130*	2.2
offer drink to guests			-.135**	1.4
cons non cereal staple			.108*	1.3
chewing problems			.117*	1.1
nausea			-.143**	1.0
lock&key test			.145**	1.0
kitchen garden			-.105*	1.2
kyphosis			-.101*	0.9
<i>Controlled for:</i>	age		age	
	food intake		food intake	
	variables†		variables†	
	social support		social support	
	variables‡		variables‡	
	arthritis		arthritis	
	chewing probl			
	paid labour			
	plate tapping			
constant B	25.33***		28.60***	
multiple R	.510		.441	
R <sup>2</sup> (%)	26.4		19.5	
adjusted R <sup>2</sup> (%)	24.7		17.2	
SE	5.51		6.87	
F	15.68***		8.51***	
df	403		398	

Significance levels: \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$

† Food intake variables were: consumption of cooking oil, green vegetables, non cereal staples, 1 meal per day, eating enough, food diversity score, preparing food self.

‡ Social support variables were: being consulted by relatives and friends, sharing feelings, having people around to talk.

**Annex 7.3C Regression results for nutritional vulnerability with MUAC as dependent variable**

MUAC	MEN		WOMEN	
	$\beta$	$\Delta R^2$ (%)	$\beta$	$\Delta R^2$ (%)
handgrip strength	.366***	14.3	.235***	4.6
blood pressure	.178***	3.0	.095*	0.9
smoking	-.148**	2.5		
chair stands	.131**	1.5	.213***	2.4
receive money as gift	.098*	0.9		
literacy	-.092*	0.8		
poor health			-.138**	2.9
offer drink to guests			-.131**	1.0
cons non cereal staple			.127**	1.4
nausea			-.095*	0.9
<i>Controlled for:</i>	age		age	
	food intake variables†		food intake variables†	
	social support variables‡		social support variables‡	
	chewing probl		smoking	
	paid labour		arthritis	
	constipation		lock&key test	
	word recall test		kitchen garden	
	wounds/ulcers		kyphosis	
	mobility			
	kitchen garden			
constant B	19.11***		20.97***	
multiple R	.480		.380	
R <sup>2</sup> (%)	23.0		14.1	
adjusted R <sup>2</sup> (%)	21.9		12.5	
SE	1.71		2.66	
F	19.86***		9.13***	
df	404		397	

Significance levels: \*\*\* $P < .001$ , \*\* $P < .01$ , \* $P < .05$

† Food intake variables were: consumption of cooking oil, green vegetables, non cereal staples, 1 meal per day, eating enough, food diversity score, preparing food self.

‡ Social support variables were: being consulted by relatives and friends, sharing feelings, having people around to talk.



**Annex 7.3D Regression results for nutritional vulnerability with sum of skinfolds as dependent variable**

SUM SKINFOLDS	MEN		WOMEN	
	$\beta$	$\Delta R^2$ (%)	$\beta$	$\Delta R^2$ (%)
blood pressure	.249***	6.4	.102*	1.1
smoking	-.128**	2.6		
age	.154**	1.3		
literacy	-.118*	1.4		
eating enough	-.114*	1.0		
which day	-.105*	1.1		
paid labour			-.128**	1.9
coughing			-.125*	1.8
wounds/ulcers			-.109*	1.2
past econ status			-.115*	1.1
nausea			-.098*	0.9
<i>Controlled for:</i>			age	
	food intake variables <sup>†</sup>		food intake variables <sup>†</sup>	
	social support variables <sup>‡</sup>		social support variables <sup>‡</sup>	
	poor health		poor health	
	nausea		smoking	
	handgrip		disability	
	mobility		dressing	
	lock&key test		kyphosis	
constant B	1.0***		1.45***	
multiple R	.37		.280	
R <sup>2</sup> (%)	13.8		8.0	
adjusted R <sup>2</sup> (%)	12.5		6.7	
SE	0.09		0.14	
F	10.57***		5.79***	
df	401		403	

Significance levels: \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$

<sup>†</sup> Food intake variables were: consumption of cooking oil, green vegetables, non cereal staples, 1 meal per day, eating enough, food diversity score, preparing food self.

<sup>‡</sup> Social support variables were: being consulted by relatives and friends, sharing feelings, having people around to talk.

**Annex 7.3E Regression results for nutritional vulnerability with BMI as dependent variable and corrected handgrip as independent variable**

BMI	MEN		WOMEN	
	$\beta$	$\Delta R^2$ (%)	$\beta$	$\Delta R^2$ (%)
handgrip strength	.290***	8.3	.165**	3.6
smoking	-.226***	4.0		
plate tapping	.194***	2.7		
blood pressure	.111*	1.4	.144**	1.7
bleeding gums	-.129**	1.3		
paid labour	-.109*	1.2		
kitchen garden	.099*	0.9		
light hh act	.098*	0.9		
cons non cereal staple			.156**	1.7
1 meal per day			-.146**	1.9
offer drink to guests			-.131*	1.1
receive food as gift			.114*	1.1
lock&key test			.115*	1.2
<i>Controlled for:</i>	age		age	
	food intake		food intake	
	variables†		variables†	
	social support		social support	
	variables‡		variables‡	
	poor health		poor health	
	kyphosis		kyphosis	
	literacy		dressing	
	lock&key		memory probl	
			arthritis	
constant B	16.35***		16.37***	
multiple R	.455		.351	
R <sup>2</sup> (%)	20.7		12.3	
adjusted R <sup>2</sup> (%)	19.1		10.5	
SE	1.67		1.99	
F	12.69***		6.91***	
df	397		351	

Significance levels: \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$

† Food intake variables were: consumption of cooking oil, green vegetables, non cereal staples, 1 meal per day, eating enough, food diversity score, preparing food self.

‡ Social support variables were: being consulted by relatives and friends, sharing feelings, having people around to talk.

**Annex 7.4 Proportions of people with and without oedema who presented risk factors**

	Oedema	Normal		Oedema	Normal
Marital status			Mobility		
in partnership	51.6	59.4	impaired mobility	67.2	22.8
no partnership	48.5	40.6	Health		
Educational status			poor health	42.9	12.6
illiterate	89.1	71.0	high BP	31.3	18.8
Past occupation			poor sight	50.8	22.9
middle	53.1	63.0	chewing problems	52.4	46.9
higher	46.9	37.0	bleed gum	25.4	19.6
Current soc-ec status			spontaneous	1.6	1.3
poor	73.4	62.1	wounds	17.5	8.9
Living arrangement			>2 wk healing time	7.9	3.9
without younger adults	4.7	4.1	watery stool	6.5	1.9
Activities			> 1 wk	4.8	1.2
gardening	46.9	72.0	pain when passing stool	22.6	15.4
heavy household act	28.1	42.0	> 1 wk	17.7	12.7
light household act	65.6	71.0	nausea	24.2	12.8
child care	3.1	7.4	vomiting	11.3	5.0
paid labour	11.0	19.6	fever	20.6	17.4
Food satisfaction			> 1 wk	9.5	12.1
1 meal/day	15.9	5.2	arthritis	20.6	8.1
not eating enough	77.8	62.0	freq. memory problems	42.9	35.3
Dependence in ADL			freq. depression sympt.	29.8	22.0
feeding	6.3	1.8	alcohol	46.0	64.9
transferring	21.9	6.4	smoking	28.6	59.8
dressings	14.1	3.0	kyphosis	12.5	5.0
toileting	12.5	4.0			
continence	57.8	41.1			

